Access to online services for sexually transmitted infection self-sampling at home

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Access to Online Services for Sexually Transmitted Infection Self-sampling at Home

PhD Thesis

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Abstract

Recently, STI self-sampling services have become available online. However, there is limited information regarding who will access these services, the factors that influence access and the role that online services play within the wider sexual health service mix. This PhD investigates access to online services.

This mixed methods PhD involves qualitative and quantitative enquiry. Demographic differences between users of online services and face-to-face services are identified by analysis of routinely collected data. Qualitative interviews explore the factors underlying the differences in access. A survey tool is then developed, and scales are psychometrically validated to measure these factors. The final survey tool is used to investigate the factors influencing use of online services. These findings are analysed using cross-sectional analysis and repeated measures analysis.

Analysis of routinely collected data showed that demand for online services is high, although the access to online services was lower among young people aged 16 to 20 years and BME groups. Qualitative interviews revealed that the factors influencing use of online services relate to the individual and to their circumstances at the time of testing. Analysis of survey results found that among factors relating to the individual, a lack of institutional trust and a preference for professional support is a barrier of access to online services. Additionally, less normative beliefs around online testing, low self-efficacy and low trust in online services are a barrier to testing online now, however, among users this is likely to change over time as the service becomes more established. Among factors relating to users' circumstances at the time of testing, not wanting to wait in a waiting room and finding it difficult to attend a clinic facilitated access to online services. However, higher perceived risk of infection and difficulty concealing a package received in the post are barriers to access.

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Thesis Overview

This mixed-methods thesis is presented over ten chapters. The first two chapters represent introductory chapters, Chapter 3 reports review findings, Chapter 4 provides a methods overview, Chapters 5 through 9 report results of studies and the Chapter 10 discusses the results of the thesis. A short description of each chapter is provided below.

Chapter 1 provides background information that sets the scene for the evaluation presented in this thesis. It describes the epidemiology of STIs, including important populations for access to STI testing. It then describes sexual health service delivery and the commissioning of STI testing innovations in England. It describes how service innovations may improve access to STI testing before focusing on home-based testing and SH:24, an online service for STI self-sampling at home. Finally, it makes the case for evaluating access to services innovations and describes the approach this thesis uses to evaluate access.

Chapter 2 defines and conceptualises access and equity of access to services. The chapter draws on the wider literature to provide a background discussion and justification for the interpretation of equity of access adopted in this thesis. It also discusses different approaches to evaluating access. Finally, it highlights relevant existing models of access and describes the behavioural model of access to services, which will be applied in the thesis.

Chapter 3 presents a scoping review of the existing literature for access to online services for STI self-sampling at home. It investigates potential and realised access to online services and discusses the findings within a specified theoretical model. It investigates access by investigating the factors that influence access. It identifies gaps within the literature that this thesis can address and positions the thesis within the context of the wider academic community investigating access to online services for STI self-sampling at home.

Chapter 4 provides an overview of the methods and data sources used in this thesis. It describes the style of the thesis, the research objectives, the study designs employed, and ethical approval obtained. It also gives a detailed description of the study setting and the online service SH:24.

Chapter 5 takes the first step towards understanding access to SH:24 by presenting an exploratory, cross-sectional study of users of online and clinic services in the London Boroughs of Lambeth and Southwark. Routinely collected service use data is analysed to compare the characteristics of those completing an STI test using an online service for STI self-sampling at home to those using clinic services in the London Boroughs of Lambeth and Southwark. It also compares the characteristics of those who ordered a test from online services and returned it, to those who ordered a test and did not return a sample to identify potential barriers to online service use. The findings of this chapter inform the direction of the investigation into equity of access to online services within this thesis.

Chapter 6 explores the underlying reasons for the differences in access between groups that were seen in Chapter 5. It does this through qualitative interviews. It investigates the process of access through the exploration of barriers and facilitators to access that are associated with the individual and those that are

associated with the service. Analysis of interview data generates major themes that represent the barriers and facilitators to use of online services. The findings then go on to describe the domains and sub-domains within these themes. The discussion views these themes through the theoretical framework of access to medical care and discusses the findings in relation to other studies in the field.

Many of the themes identified in Chapter 6 represent theoretical phenomena that are not readily observable by direct means. Chapter 7 develops a measurement instrument to reveal these theoretical themes. In Chapter 7, themes are defined, and survey items are developed to make up 10 multi-item scales and four single items. These scales and items together form the initial composite measurement scale for the measurement of the barriers and facilitators to access to online services. Chapter 8 goes on to establish the psychometric properties of the measurement instrument developed in Chapter 7.

Chapter 9 uses the composite measurement scale tool developed in Chapters 7 and 8 to investigate the barriers and facilitators to use of online services for STI-self-sampling at home. It investigates how individual factors influence use of online services among a group of people who have received equal information about online services for STI testing. It includes an analysis of barriers and facilitators that relate to the individual and how they relate to the most recent place of testing for an individual. It also investigates the extent to which factors that are highly variable between testing episodes influence whether an individual accesses STI testing using an online or face-to-face service. This, final results chapter is the culmination of the investigation into access to online services for STI self-sampling at home. In the discussion, the importance of these findings is discussed in relation to the wider literature and within the theoretical framework.

Chapter 10 first summarises the findings of the thesis. The findings are then interpreted in relation to equity of access to online services, drawing on concepts of access and equity defined in Chapter 2. Judgements of equity are made by understanding the factors influencing access to online services within the wider context of sexual health service delivery in Lambeth and Southwark. The implications of the findings to online service developers, commissioners and for future research are then described. Finally, the strengths and limitations of the wider thesis and the model applied within the thesis are discussed before the thesis is concluded.

Publications and Presentations

This thesis includes one original paper published in a peer reviewed journal and five chapters that will contribute to planned publications. The ideas, development and writing up of all the chapters within this thesis were the principal responsibility of myself, the candidate, working within the School of Population Health & Environmental Sciences under the supervision of Dr Paula Baraitser, Professor Caroline Free and Dr Ioannis Bakolis. The inclusion of co-authors in the publication of Chapter 5 reflects the collaboration between researchers and acknowledges input into team-based research. Chapter 5 has been reformatted for consistent presentation within the thesis and the published paper is available in Appendix E.

Table 0-1 Publications and Presentations

Thesis Chapter	Publication/Presentation Title	Status
Chapter 3	Scoping review of the factors that influence access to online services for STI self-sampling at home	Planned
Chapter 5	Equity of access to online sexually transmitted infection self-sampling services in Lambeth and Southwark: An early view of the data	Presented Poster presentation at BASHH 2016
Chapter 5	Comparing the characteristics of users of an online service for STI self-sampling with clinic service users: a cross-sectional analysis	Published in the journal Sexually Transmitted Infections 2017
Chapter 6	Development and psychometric evaluation of a composite measurement tool for factors influencing access to online services for STI self-sampling at home	Planned
Chapter 7	Development and psychometric evaluation of a composite measurement tool for factors influencing access to online services for STI self-sampling at home	Planned
Chapter 8	Development and psychometric evaluation of a composite measurement tool for factors influencing access to online services for STI self-sampling at home	Planned
Chapter 9	What factors influence access to online services compared to face-to-face services for STI testing. A cross-sectional and repeated measures analysis	Planned

Abbreviations

Abbreviation	Meaning
aOR	Adjusted Odds Ratio
ART	Anti-retroviral Therapy
BASHH	British Association for Sexual Health and HIV
BME	Black and minority Ethnic
CFA	Confirmatory Factor Analysis
CI	Confidence Interval
CMS	Composite Measurement Scale
CT	Chlamydia Trachomatis
EFA	Exploratory Factors Analysis
FSRH	Faculty of Sexual and Reproductive Healthcare
GC	Neisseria gonorrhoeae
GP	General Practice
GUM	Genito-urinary Medicine
GUMCAD	Genito-urinary Medicine Clinic Activity Dataset
GSTC	Guy's and St Thomas' Charity
GSTT	Guy's and St Thomas' Trust
HCP	Health Care Provider
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HRA	Health Research Authority
IMD	Index of Multiple Deprivation
KCH	King's College Hospital
LSOA	Lower Super Output Area
MSM	Men who have sex with men
NAAT	Nucleic Acid Amplification Test
Natsal	National Survey of Sexual Attitudes and Lifestyle
NCSP	National Chlamydia Screening Program
NHS	National Health Service
OR	Odds Ratio
PCR	Polymerase Chain Reaction
PHE	Public Health England
PID	Pelvic Inflammatory Disease
PMT	Protection Motivation Theory
PN	Partner Notification
POCT	Point of Care Test
PTK	Postal Testing Kits
PWID	People Who Inject Drugs
RCT	Randomised Controlled Trial
REC	Research Ethics Committee
SHHAPT	Sexual Health & HIV Activity Property Type

SMS	Short Messaging Service
SRH	Sexual and Reproductive Health
STI	Sexually Transmitted Infection(s)
STROBE	Strengthening Reporting in Observational Studies in Epidemiology
SW	Sex worker
TPB	Theory of Planned Behaviour
UAI	Unprotected Anal Intercourse
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation

Chapter 1 BACKGROUND

CHAPTER INTRODUCTION

This PhD evaluates access to SH:24, an online service for STI self-sampling at home. This chapter provides background information that sets the scene for this evaluation. It describes the epidemiology of STIs, including populations for whom access to STI testing is most important. It then describes sexual health service delivery and the commissioning of STI testing innovations in England. It describes how service innovations may improve access to STI testing before focusing on home-based testing and SH:24, an online service for STI self-sampling at home. Finally, it makes the case for evaluating access to services innovations and describes the approach this PhD uses to evaluate access.

SEXUALLY TRANSMITTED INFECTIONS

Sexually Transmitted Infections (STIs) are an important cause of ill-health globally [1]. The World Health Organisation (WHO) estimates that worldwide, more than one million STIs are acquired every day and that at any given time there are approximately 349 million people infected with a curable STI [2]. In addition to curable STIs, there are an estimated two million new Human Immunodeficiency Virus (HIV) infections each year and currently 37 million people living with HIV [3]. HIV, and many STIs are asymptomatic or mildly symptomatic initially, resulting in many infections going undiagnosed. Therefore, the scale of STI prevalence is difficult to establish, and may well be underestimated [4].

There are over 30 different infectious agents that have been associated with sexual transmission, therefore STIs present with diverse clinical presentations and epidemiology [5]. Common symptoms include vaginal discharge in women, urethral discharge or burning in men and genital ulcers and abdominal pain in both men and women [2]. STIs that cause genital ulceration also facilitate the acquisition and transmission of HIV [6, 7]. Delayed onset of treatment can increase the risk of complications and long-term health problems including pelvic inflammatory disease (PID), epididymitis, infertility, ectopic pregnancy, cervical cancer, damage to the cardiovascular and central nervous system and fetal and neonatal morbidity and mortality [8]. In addition to physical complications, infection with an STI may also result in stigma and abuse and may have negative effects on personal relationships and therefore may have an impact on psychological wellbeing [8].

In England, STIs are a major public health concern. Chlamydia is the most frequently diagnosed STI in the England. In 2015 there were 435,000 new diagnoses of STIs, 46% of which were chlamydia infections [9, 10]. Despite the decrease in overall diagnoses between 2014 and 2015, diagnoses of infectious syphilis increased by 20% (from 4,412 to 5,288) and diagnoses of gonorrhoea increased by 11% (from 37,100 to 41,193)[11]. These increases remained after adjusting for increases in attendances to sexual health clinics in the same period. In addition, new diagnoses of HIV infection remain high and the amount of undiagnosed HIV infection remains substantial. In 2015 there were over 6000 new HIV diagnoses and an estimated

13,500 people (13% of those infected) living in the United Kingdom (UK) unaware of their HIV infection [12]. Late diagnosis of HIV is a significant concern with 39% of adults diagnosed late [12]. This proportion is higher among heterosexuals, with 55% of heterosexual men and 49% of heterosexual women diagnosed late [13].

STIs are distributed heterogeneously within the population, therefore risk of infection is higher among some groups. Risk of STI varies by age, sexual orientation, ethnic group and geographical location. Risk is highest among young people aged between 16 and 24, in men who have sex with men (MSM), in black minority ethnic groups and in urban populations [5]. Rates of diagnosis are higher in urban areas, and of the urban areas, rates are highest in London [9]. However, geographical variances in distribution of STIs largely reflect the concentration of higher-risk groups and access to services for diagnostic testing and treatment [13].

Teenagers and young adults in England have the highest risk of chlamydia and gonorrhoea [14]. This is thought to be due to higher rates of partner change among younger people. Evidence from the National Surveys of Sexual Attitudes and Lifestyles (Natsal) indicates that, compared to older people, younger people are more likely to report partner change in the past year [15]. Among young people aged 15 to 19 years, women are more likely to be diagnosed with chlamydia, gonorrhoea or syphilis than men in this age group. This could be a result of higher levels of screening among young women in the National Chlamydia Screening Program (NCSP) [16], but could also reflect disassortative sexual mixing patterns between young women and older male partners [17].

MSM experience higher rates of STIs, HIV, other blood born infections as well as sexually transmitted enteric infections such as *Shigella flexneri,* compared with women and with men who do not have sex with men [14]. Eighty one percent of syphilis diagnoses in England in 2016 were among MSM [14]. Fifty-three percent of HIV diagnoses in the UK in 2017 were among MSM [18]. In addition to syphilis and HIV, there was a seven-fold increase in gonorrhoea diagnoses among MSM between 2007-2015 [14]. Like young people, the underlying reason for higher incidence of infection among this population is thought to be higher rates of partner change. However, the rates among this group may also be a result of the complex assortative mixing patterns concentrated among relatively small numbers of people [5, 15]. These mixing patterns have recently been further facilitated by geosocial networking applications and the gaining popularity of ‘chemsex’ [19, 20].

Black ethnic minorities have higher rates of STIs compared with the general population [5]. Black Caribbean and black other (non-African, non-Caribbean) populations have the highest diagnosis rates of STIs of all ethnic groups [14]. In 2016, black Caribbean populations had four times the chlamydia and gonorrhoea diagnoses compared with the general population [14]. Black Africans have relatively lower rates of STI infection but remain an important group for targeting HIV testing, particularly among those born in countries with high HIV prevalence [18]. Socioeconomic deprivation among these ethnic groups may explain some of the disparities in STI diagnosis rates between these groups and the general population, however it does not explain all of them [21]. Higher numbers of sexual partners among black Caribbean and black other

populations are reported [21]. Concurrent sexual partners and cultural barriers to condom use may also contribute to higher rates in diagnoses among these groups [21]. Differences in health seeking behaviour among these groups may also contribute to higher rates of diagnosis [22]. Therefore, there is growing recognition of the influence of social and structural barriers that exist among black and minority ethnic groups on accessing sexual health services [22].

STI and HIV rates are highly variable between geographical areas in the UK. Nationally, STI rates are highest in urban areas and especially in London [23]. The London region has the highest diagnosis rate for syphilis, gonorrhoea and new HIV diagnoses when compared to other regions in the UK [23]. Over half (51%) of all new HIV diagnoses in MSM in the UK were made in London [9]. There is also variation of STI risk within local areas in London, where the Borough of Lambeth has more than five times the rate of STI diagnoses (excluding chlamydia) (3263/100,000, 95%CI=3191, 3336) of the Borough of Bexley (631/100,000, 95%CI=592,672) [23]. These variations in STI risk by geographical location are a result of the variation in the distribution of core groups of people at risk and area level deprivation [5, 9, 24, 25].

A growing body of evidence shows that risk of STI or HIV infection is likely to be higher among transgender people [26]. In a systematic review of the burden of HIV among transgender women, the odds ratio for being infected with HIV in transgender women compared to all adults of reproductive age across 15 countries was aOR=48.8 (95% CI 21·2-76·3) [27]. There is a small amount of evidence that exists for risk of infection among transgender men that suggests that HIV prevalence among transgender men may be higher than adults of reproductive age in the USA [28]. There is no evidence explicitly identifying risk of infection among people who identify as non-binary. Notable gaps in the existing evidence for risk in transgender men and women remain. Currently, prevalence estimates of infection among transgender men and transgender women in England are limited because risk of infection of STIs or HIV is presented by grouping transgender men with men, and transgender women with women [29]. Many studies fail to examine risk in transgender people by gender of their sexual partner, making assumptions that transgender men have sex with women and transgender women have sex with men [30]. Furthermore, most research fails to take account of the effect of multiple intersecting risks that transgender people may be subject to, for example risks associated with age, sexual orientation, ethnic group or high-risk sexual behaviours. Therefore, transgender men and women are likely to be an important group for risk of infection, although the evidence for quantifying risk and for how to effectively support these groups is currently limited.

Case identification and treatment is the most effective form of prevention of STIs [31]. By identifying infections within the population and then treating them, the chain of transmission is broken and this therefore reduces the prevalence in the population [32]. Because many STIs including HIV, syphilis, chlamydia and gonorrhoea are infectious and often asymptomatic, rapid access to diagnostic testing is central to the prevention strategy to prevent onward transmission [5, 33]. Late diagnosis of STIs and HIV can result in increased morbidity and mortality, poorer response to treatment and increased health care costs [34]. From a public health perspective, there is evidence that people who are aware of their infection are less likely to transmit the infection [35]. STI testing services that target groups in whom the risk of infection and onward transmission are more likely to detect STIs and have greater public health impact

[36]. Therefore, Public Health England (PHE) has prioritised prevention of STIs and HIV and providing rapid access to sexual health services, particularly those that target high-risk groups [37].

SEXUAL HEALTH SERVICES FOR STI TESTING IN ENGLAND

In 1916, the Royal Commission on Venereal Diseases was established to tackle increasing rates of gonorrhoea and syphilis in the UK [38]. The following year, the Venereal Diseases Act was put into place to facilitate the provision of free, confidential and open access STI services [39]. Since 1917 there have been multiple changes to the organisation of sexual health services. However, free, confidential and open access services remain a priority for sexual health service provision today [40].

Sexual health strategy is developed at a national level by PHE. The strategic plan set out by PHE uses surveillance data to build the evidence base for commissioning effective sexual and reproductive health (SRH) services and the development of new services. The current strategic plan tailors its approach to address the needs of three key areas to reduce inequalities and improve sexual health outcomes [37]. These three areas include: higher-risk population groups, geographical areas that experience poor SRH and key life stages for those within the population [37, 40]. Therefore, PHE aims to ensure that any service interventions that are commissioned are appropriately targeted at the populations most at risk and evidence based [37].

STI testing is commissioned under the umbrella of sexual health services which includes STIs, contraception, reproductive health and HIV. Following the Health and Social Care Act 2012 that reformed service delivery in the UK, The Local Authorities Regulation 2013 introduced legislation that each local authority shall provide, or shall make arrangements to secure the provision of, open access sexual health services in its area[41, 42]. Since April 2013, most of these services have been commissioned at a local level by local authorities or local governments. By commissioning services at a local level, commissioning takes place close to patients and communities. Commissioners within local authorities can utilise their comprehensive understanding of the local population, the sexual health characteristics of the local community, including information on morbidity, services, resources and activity to more effectively target higher-risk groups [43]. Targeting groups appropriately is important because poorly targeted health promotion campaigns may not enable access for higher-risk groups. Poor targeting has been a barrier in the UK, where a lack of culturally appropriate and adequately targeted health promotion for black Africans acts as a barrier to accessing sexual health services for STI testing [44].

In-line with the 1917 Venereal Disease Act, commissioners of STI testing services are mandated to provide a sexual health service network which offers a range of services that provide fast, open access which is free of charge and confidential [40]. Open access services allow users to attend any sexual health service, in or out of their local area, without needing to visit their General Practice (GP) first. ‘Fast’ access requires that 98% of users are able to either ‘walk in’ or be offered an appointment within two working days of contacting a service commissioned to manage STIs [40, 45]. The standards also require that sexual health services are available free of charge to the user and be completely confidential to increase the privacy associated with attending what some population groups consider a highly stigmatised service. Because of

this, patient records within sexual health services are not shared with primary care services, allowing patients confidentiality when accessing sexual health services. The confidentiality afforded by these types of services reduces barriers to access for populations who do not access testing for risk of fear of deportation or risk to security or livelihood [44, 46].

Commissioners are also mandated to provide STI testing in a range of settings. These can include community outreach settings, GP settings and specialist sexual health services such as Genitourinary Medicine (GUM) services. Different settings facilitate access for different groups, therefore providing testing in a range of settings has the potential to reach a wider population [47-49]. However, the impact of these different testing settings will vary depending on the population they are serving [50]. This is exemplified by a North American study, that found Hispanic migrant workers were more likely to accept testing recommended by a health-care provider in a healthcare setting, but in contrast MSM from ethnic minorities were more likely to accept HIV testing outside health settings [49].

Community outreach services operate with an aim to increase access to testing by tailoring the service to the needs of the local target population [51]. For example, these services can target those not accessing STI testing because of structural barriers such as language, a lack of familiarity with appointment systems or long waiting times in walk-in clinics. In the UK, the integration of STI testing into community settings has increased access to STI testing and reduced clinic-based HIV-related stigma and has been cost-effective [52]. There is also evidence from a systematic review that increasing opportunities for testing in community and outreach services as well as targeted testing at gay pride events can increase testing amongst MSM in migrant communities [49].

The largest community outreach STI screening programme in England is the National Chlamydia Screening Programme (NCSP), which has been active since 2003. The NCSP uses non-clinical community settings to offer opportunistic testing to people aged under 25 years. The settings include sports clubs, pharmacies, schools, colleges and universities and nightclubs. This programme has been largely successful, achieving overall increases in testing for chlamydia among higher-risk individuals [48]. However, the programme did not reach all young people at risk. In an analysis of the third National Survey of Attitudes and Lifestyle (Natsal- 3) chlamydia prevalence was higher in women living in more deprived areas, whereas testing was not [48]. In addition, there remains a substantial proportion of higher-risk young adults who have not been tested recently. Results from the survey suggest that 30% of women and 53.7% of men who have had two or more sexual partners in the last year report had not tested recently [48].

Community settings for testing may enable access to some groups but provide barriers to access for some groups. There is some evidence that people perceive that community settings could reduce the quality of care and privacy of testing. In qualitative studies with MSM and black and minority ethnic (BME) groups, concerns were raised about possible breaches in privacy, stigma and the ability of community services to provide a high professional standard of care for HIV testing in the community [53].

In many local areas, GP surgeries and other non-specialist services offer STI testing services. GP surgeries offer an obvious opportunity to provide opportunistic STI testing to higher-risk groups and reduce pressure

on GUM services [50]. Early pilot studies suggest that integrating the management of uncomplicated STIs into GP surgeries has the potential to reduce pressure on GUM clinics [54]. However, there remains a high level of heterogeneity between GP surgeries, and doctors within surgeries in terms of whether they offer STI testing and to whom they offer it [55]. In a UK based qualitative study that investigated provider barriers to offering STI testing in GP surgeries, GPs reported difficulties in initiating discussions about sexual health and STI testing with patients [56]. This resulted in variation in the consistency of when and where testing was offered [56]. There is also some evidence that users perceive GPs to have a lack of expert knowledge about STIs, which discourages their attendance for testing in GP surgeries [57, 58].

The availability of specialist GUM services can facilitate faster access to diagnosis, preserve anonymity and offer convenience [47, 59-62]. GUM settings also have the potential to meet the complex needs of vulnerable users that attend these clinics without the need for referral because they are staffed by specialist clinicians [47, 61]. According to analysis of Natsal-3 data, these services are the mainstay of STI testing in the UK with 58.3% of women 50.8% of men aged 16-24 who have reported at least one sexual partner over their lifetime having attended a GUM in the past 5 years [24]. They also offer fast treatment and continuity in care. In a retrospective analysis of 231 gonorrhoea infections amongst individuals presenting to GUM services and non-GUM services in Scotland, a higher proportion of of GUM clinic attendees (86%) received diagnosis and treatment at first presentation, compared with patients who presented to non-GUM settings (64%) (P=<0.001) [59]. Most GUM services prioritise rapid access by offering a mixture of appointments and 'walk in services', which are associated with a reduction in both user and provider delay [62]. Offering STI testing alongside contraceptive and other sexual health services increases the convenience for the user and reduces rate of default that may occur when users are referred between services [50]. Users of GUM services maintain anonymity because records are not shared with other services [60].

While GUM services can facilitate access through the mechanisms detailed above, they may provide barriers to access among some groups [50, 63-65]. A paper examining models of sexual health care found users concerns that too few staff within GUM services, coupled with a high demand for complex services which could result in long wait times and delays to treatment, were a barrier to access [50]. Because GUM services are often oversubscribed, overcrowding in waiting rooms and long wait times can increase fear of a loss of privacy among groups for whom perceived stigma is a concern [46, 63, 64]. Additionally, a lack of knowledge about GUM services or how to use them may be a barrier to access among migrant populations [49, 63].

Each type of setting for STI testing facilitates access in some ways but may also increase barriers in another. Providing a range of STI settings is key to achieving access among different population groups. In England, commissioners are challenged with providing an appropriate service mix to meet the needs of the local population under the ever-mounting pressure of increasing service demand [43]. Coupled with this, a recent downturn in the economic climate has resulted in increasing pressures on resources [37, 43]. These pressures have created a pressing need for a rethink of how services are delivered.

Service innovation provides a potential solution for cost-effective service delivery that meets the needs of the population [43]. Evidence from many European countries shows that it is possible to improve service access through innovation [66]. However, just like any other type of service delivery, the impact that an innovation has on service access is dependent on to whom the service is accessible. The following section describes service innovations to increase access to STI testing.

INNOVATIONS TO INCREASE ACCESS TO STI TESTING

Service innovation in health service delivery is defined as a novel set of behaviours, routines, and ways of working that are discontinuous with previous practice, are directed at improving health outcomes, administrative efficiency, cost-effectiveness, or users' experience and that are implemented by planned and coordinated actions [66]. Service innovations have the potential to increase access to testing, target higher-risk groups, and be cost effective [67].

A service innovation may increase service capacity by increasing the number of services available to a population [68]. It may increase existing service efficiencies, and therefore cost-effectiveness by changing the provider mix or improving existing systems [68]. A service innovation may improve access by targeting higher-risk groups through information campaigns, or by developing the service specifically catering for the needs of these groups. Finally, an innovation may improve specific aspects of services such as opening times, waiting times or providing walk in clinics [68]. In practice, many innovations do a combination of these.

Service innovations may be technological innovations or non-technological innovations. In the context of health, technological innovations are those that comprise both product innovation and process innovation [66]. Non-technological innovations are those that involve organisational innovation such as new management strategies or business practice [66]. This thesis is concerned with a technological innovation in sexual health service delivery.

The rapidly changing field of communication technologies has provided a wide range of opportunities for innovation development in STI testing. Use of the internet is widespread. In the UK, 80% of the population use the internet daily and in 2016 77% of the population bought goods and services online [69]. Because of this, the use of the internet as a platform for the delivery of public health interventions has increased dramatically over the last fifteen years [70]. These interventions are now more accessible than ever on both computers and mobile devices [70]. Within sexual health, internet-based innovations in STI testing can provide sexual health information, provide support and provide a channel for patient-provider communication using a wide range of techniques [71]. The internet brings with it many key advantages for STI testing, including the potential for broadening access by increasing convenience to users, providing timely information and reducing stigma [71, 72].

In addition to the internet, many new innovations are harnessing the potential of developments in the field of diagnostic testing that mean that STI testing can be done in out of clinic settings, such as at home [67, 73-75]. Advances in diagnostic technologies have enabled the development of services offering sampling

outside of clinic settings. Diagnostic testing for chlamydia and gonorrhoea previously relied on the use of cell culture, which requires viable cultures of bacteria. Since the 1990s, diagnostic testing technologies have developed to enable more highly sensitive and specific testing using nucleic acid amplification tests (NAAT) [73, 76]. Most NAAT tests use polymerase chain reaction (PCR) and detect amplification productions in real time, therefore reducing the time it takes to test [77]. NAAT tests allow for testing of both chlamydia and gonorrhoea from the same sample. Unlike cell culture, they do not require a viable organism. Samples can be taken from first stream urine or vagina, cervix, rectal, pharyngeal or urethral swabs meaning sample collection is relatively easy to do compared to cell culture which requires a physical examination [78]. NAAT tests are also less demanding in terms of specimen quality, transportation and storage than cell culture testing [79]. These characteristics of the NAAT test have extended the range of where these tests can be carried out and who can carry them out, enabling patients to take their own samples outside of clinic settings [73].

NAAT tests are more sensitive than cell culture testing for both chlamydia and gonorrhoea [74]. They have >96% sensitivity in both symptomatic and asymptomatic gonorrhoea infections [79]. This is equivalent in urine and urethral swab specimens in men [79]. Sensitivity for oropharyngeal (84%) and rectal gonorrhoeal (93%) infection in MSM exceeds sensitivity of cell culture (41% and 43% respectively) [80]. NAAT tests are 20-30% more sensitive than cell-culture in the diagnosis of chlamydia using first catch urine or vulvo-vaginal swabs, although vulvo-vaginal swabs are preferred as the concentration of chlamydia is higher in vulvo-vaginal swabs compared to urine [77, 80]. Additionally, the sensitivity is equivalent between clinician taken and self-taken vulvo-vaginal and endocervical swabs for chlamydia in women [79]. The specificity of NAAT tests is >97% for diagnosis of gonorrhoea or chlamydia regardless of specimen type or test [81].

The development of fourth generation HIV testing has enabled sample collection for both HIV and syphilis outside of clinic settings. These serological tests can be carried out on relatively small amounts of blood, meaning patients can self-collect using a lancet to prick their skin. Not only do these tests enable outside of clinic sampling, they offer more accurate testing for HIV, more proximal to exposure. These are more sensitive and specific than previous generations of tests and are now the recommended tests for routine use in the UK [34]. Sensitivity for these tests is >99.8% and specificity is >99.7%. Additionally, international policy on HIV testing no longer places as much emphasis on the importance of HIV pre and post-test counselling [82]. HIV knowledge is now more widespread and if antiretroviral therapy (ART) is started at early stages of infection, the life expectancy of HIV infected patients is almost the same as the general population [83]. As a result, early detection of HIV through home-based testing has been prioritised over pre-test counselling [82]. Furthermore, these tests used in out of clinic settings have proven to be successful in diagnosing previously undiagnosed infections in some at-risk populations and have been acceptable to the populations using them [16, 67, 84].

HOME-BASED TESTING

Service innovations that offer home-based testing for STIs harness the opportunities created by diagnostic and communication technologies. Home-based testing includes any type of service that offers self-testing or self-sampling kits at home. Testing at home is included in the umbrella term of ‘out of clinic’ testing,

although it refers specifically to testing that is available within the private environment of the users' home [85]. Self-testing refers to the process of a person collecting a specimen, performing a test and interpreting the results in private [85]. Self-sampling refers to the process of a person collecting a specimen, returning the specimen to the laboratory for testing and receiving the results from the laboratory [85].

The characteristics of home-based services vary between services. They vary in terms of the platform they use for service delivery, method of test kit delivery, method of test kit return (for self-sampling), the method of results notification, whether they offer treatment, partner notification and the type of support provided [75, 86]. They also vary in terms of the type of STI tests available and cost to user. Some services offer testing for a range of STIs while others offer testing for specific STIs, such as HIV, or chlamydia [87]. In England, many of these services are commissioned by local health and are free of charge to the user, although some home-testing services are privately run therefore users incur a cost [86-88].

Many of these services now use digital platforms for service delivery [75]. Digital platforms include the internet and mobile phones. Many services operate through a website that can be accessed now through mobile phone applications or web browsing on mobile phones [89]. The interface that users interact with may be as simple as an order form, or as comprehensive as a 'virtual sexual health clinic' that offers sexual health promotion, sexual health information and support via chat or video [89].

The method of test kit delivery varies between home-based testing services. Most services now offer postal delivery of test kits that users order through a digital platform [89]. Screening campaigns may target users by delivering test kits in person, sending postal test kits (PTK) with invitations or telephone calls to target users [75, 90]. Some services allow users to order a test kit that can be picked up at designated locations [75]. The method used for specimen return also varies between services with most using postal return of specimens and some offering drop off locations or in person pick-up [75].

It is most common for home-based testing services to deliver results by text message or phone call as this is now routine practice within most clinic services [91]. If a user tests positive for chlamydia infection, some services now offer, or are planning to offer treatment for the infection via either electronic prescriptions or postal delivery of treatment [86, 92]. Other services refer users to clinics for treatment. Partner notification services are also available within some home-based testing services [86].

SH:24

One recent home-based testing service innovation that harnesses the opportunities created by new diagnostic technology and advances in communication technologies is SH:24. SH:24 is an online service for STI-self sampling at home. In March 2015, SH:24 became available to residents of the London Boroughs of Lambeth and Southwark. Via the SH:24 webpage, residents of the boroughs can order an STI test free of charge. At the time of the evaluation, the SH:24 service provided information about STIs and STI testing, and the opportunity to order a free self-sampling kit. The kits were posted to a user's address where they could self-sample. These kits were available for testing four asymptomatic STIs of public health importance in the UK; HIV, syphilis, gonorrhoea and chlamydia. Once the user had taken the samples, they return the

samples to the laboratory via the post. Results were sent to the user via text message and they were asked to attend a clinic for treatment. Users reactive for HIV infection were phoned with their results and asked to attend a clinic for confirmatory testing. Since this evaluation, some design aspects of the service have changed. The website interface has changed over time, and the support for users has been developed. However, the overall service, and what it delivers remains the same. More detailed information about SH:24 at the time of the evaluation is available in Chapter 4.

SH:24 was introduced to improve access to STI testing by expanding the capacity of services, offering an additional point of contact for STI testing through the online service [93]. In the funding application for SH:24, it was argued that it has the potential to increase access to testing when added to the existing service mix. The funding bid suggested that it may improve efficiencies and be cost-effective by shifting lower-risk groups out of clinics to online services [93]. It also suggested it may improve access to higher-risk groups, such as young people by enabling access to services that avoids any feelings of stigma or shame experienced when attending sexual health clinics[94].

The development of the service was funded by Guy's and St Thomas' Charity as part of the Health Innovation Fund [95]. The fund had identified sexual health as a key issue in Lambeth and Southwark which have some of the highest levels of sexual ill-health in England [93]. The fund awarded the grant to the developers of SH:24 to innovate and develop a new approach to sexual health service delivery that uses new and innovative technology to improve access among a higher-risk population [95].

The development of SH:24 uses a design-based approach that is agile and iterative [93]. It involves the gathering of knowledge and developing a range of ideas and solutions to expand the range of service design possibilities [93]. This was then followed by testing assumptions and focusing output. Prior to this evaluation, this build and test approach went through a series of cycles all of which included end-user engagement. The aim of this approach was to design a service that was easy to use and met the needs of the user [93].

However, whether SH:24 increases access to services, how it does so and for whom is not yet known. Ensuring any new innovation that is introduced to the service mix not only improves individuals' healthcare experience but also meets wider public health goals is essential [43, 96]. To meet public health goals the innovation must either enable access to higher-risk groups or improve efficiencies within services by shifting lower-risk groups to the innovation, freeing up clinic space for higher-risk groups. Therefore, understanding to whom the innovation provides access is essential for three reasons:

- to ensure services are delivering improvements in access
- to ensure services are appropriately targeted at the populations most at risk and;
- to ensure services are evidence based [37, 96].

This thesis evaluates access to SH:24, an online service for STI self-sampling at home, among users in the London Boroughs of Lambeth and Southwark. It describes the barriers and facilitators to use of the online service and differentiates them from the barriers and facilitators to use of clinic services for STI testing. The implications of the findings of this thesis are threefold. Findings from this thesis should underpin development

of online services to make them more widely accessible, paying special attention to groups that are not accessing online services. Findings from this thesis should also inform commissioning of services. By understanding who accesses these services and why, commissioners can deliver an effective service mix that targets higher-risk groups. Finally, findings from this thesis will contribute to the existing literature relating to the barriers and facilitators to access of online services for STI self-sampling at home.

Chapter 2 CONCEPTUALISING ACCESS AND EQUITY OF ACCESS TO SERVICES

INTRODUCTION

Understanding the concept of equity of access to services is key to evaluating access to services and informing effective commissioning of services [97]. However, a lack of consensus on the conceptualisation of access and equity has resulted in a lack of clarity in the literature on access to health services. In addition, there is lack of consensus regarding appropriate methods of evaluating these concepts. The following chapter defines and conceptualises access and equity of access to services. The chapter draws on the wider literature to provide a background discussion and justification for the interpretation of equity of access adopted in this thesis. It also discusses different approaches to evaluating access. Finally, it highlights relevant existing models of access and describes the behavioural model of access to services which will be applied in the thesis.

AIMS

To conceptualise the notions of access to services and equity of access to services and to position the concept of equity of access used in this thesis within the wider literature. This chapter also aims to describe the ways of evaluating access, a behavioural model of access to services and how the model will be used in the thesis.

ACCESS TO SERVICES

Understanding how different types of diagnostic services are accessed, and by whom, has a prominent role in policy for sexual health [40]. Access to diagnostic services is key in achieving a reduction in rates of STI transmission, especially because many STIs are asymptomatic [43]. The following section describes the various ways in which access has been defined and conceptualised. It sets out how this thesis will define and conceptualise access for the study of access to online services for STI self-sampling at home.

2.1 DEFINING ACCESS

The notion of access has been defined, redefined and continually developed by multiple authors since the 1960s. Its importance in health policy has resulted in contributions from multiple academic disciplines including sociology, health services research and health economics [97-99]. These contributions have developed the definition of access from its most crude form ‘access as the presence of health services’ to the more comprehensive definitions that exist today [99]. Table 2-1 presents the major definitions of access to health services since the 1960s.

The major focus on access to health services began in the late 1960s and early 1970s as scholars began to redefine access as utilisation of services, rather than the mere presence of services [100-102]. In 1968 Ronald Andersen published his PhD thesis titled ‘A Behavioural Model of Families’ Use of Health Services’. This laid the foundation for more than 50 years of work developing the definition and concept of access to

health services for Andersen and other authors in the field of access [100]. In his thesis, Andersen defined access as the *use* of health services and described the major domains of factors that influence use of services. In the work that followed throughout the 1970s, the definition of access as *use of* or *entry to* services remained dominant [101-104].

During the 1980s definition of access started moving towards thinking about access as a users' ability or willingness to enter and use the healthcare system [105-111]. Using this definition, access does not always require *use* of services. The terms that differentiate access relating to use of a service and, access relating to the ability or willingness to use a service are *realised access* and *potential access*.

Potential access refers to an individual who can and would access a service if they wanted or needed to. Realised use or actual use of health services refers to an individual's entry into the health service [97, 105]. Defining access in this way allows for the flexibility of accounting for individuals with opportunities to access services regardless of whether they exercise these opportunities or not. Examples of acceptable reasons for non-use of services include someone's personal preferences. With potential access, two individuals may have the same level of access and need for health services and even if only one actually uses the service, both would be considered to have access [97, 105, 112].

Following the developments in the 1980s, access has since been broadly defined as a users' ability or willingness to enter and use the healthcare system [97, 109, 113-117]. Further work from Margolis, Peters and Rogers in the mid-1990s has more recently focused on the importance of timing of access in relation to the definition of access [114-116]. Timing of access infers access is achieved at a time when the user needs health services. An example of this in relation to STI testing is that diagnostic services are accessed at an appropriate stage of infection. The concept of timing of access has actually been discussed since the 1970s when Donabedian highlighted access in relation to need [101]. However, by explicitly defining access in relation to timing of service use, these authors brought the importance of timing to the forefront.

This thesis will define access as users' ability or willingness to enter and use the health service [97, 109, 113-117]. It therefore differentiates between potential and realised access. It will view access in relation to need for services and consider timing of access. Defining access in this way allows for access to STI testing to be assessed for acceptable reasons for non-use, such as lack of perceived risk of infection (lack of need). Additionally, by using these definitions, this thesis can compare access between two modes of service delivery (clinic and online testing) allowing for the differentiation of service use that may arise from acceptable reasons, such as user preference.

2.2 CONCEPTUALISING ACCESS

Like its definition, the conceptualisation of access has been developed and redeveloped since the 1960s. The earliest conceptualisations of access viewed it in terms of the characteristics that influence access [100, 102]. In the work that followed, almost all authors in the field acknowledged that access consists of the relationship between the characteristics of the population and the characteristics of the individual using the service [97, 99, 101-103, 107, 109, 115, 116, 118]. However, the emphasis placed on these

characteristics differs between authors [101, 104, 109, 119]. Table 2-1 presents the major conceptualisations of access since the 1960s.

Two main approaches to viewing the concept of access are evident within the literature. Both approaches allow for a comprehensive view of access but do so through different lenses. One approach is to conceptualise access as the 'fit' between the user and the service [98, 108, 115, 118]. Using this approach, rather than differentiating factors relating to the user and factors relating to the service, access is viewed within defined domains. For example, Penchansky and Thomas conceptualise access as accessibility, availability, affordability, acceptability and accommodation [108]. The other approach is to conceptualise access in terms of the factors influencing (barriers and facilitators) access associated with individual and the factors influencing access associated with the service [97, 100-102, 104, 107, 111, 113, 114, 116]. This approach is often used for the empirical investigation of access because, by describing the barriers and facilitators to access associated with the individual and the service it allows for easy identification of indicators for the measurement of access [104]. However, not all conceptualisations sit firmly in one camp or the other. One example of this is Peters et al., who conceptualise access as the fit between the user and the service and acknowledge the influences of access on this [115].

As the concept of access has been developed over time, it has become broader to include wider influences to use of services. Early conceptualisations of access acknowledged barriers to accessing services [100]. Further work differentiated these factors more explicitly as; factors that influence access that are related to the *individual* and factors that influence access that are related to the *service* [101, 103, 104, 107, 113]. More recently, conceptualisations of access have included area level and system level factors such as the environment and the context of health service delivery. This may also include societal factors such as stigma, contextual factors such as health policy [9, 21, 23, 24, 27].

Access as a concept was further expanded when authors highlighted the influence of the outcome of service use on subsequent access. Aspects of the outcome of service use included continuity of care and user satisfaction [101, 105, 117, 118]. Continuity of access delves further into the process of use of services, such as the number of provider contacts required to resolve an episode of care. Satisfaction relates to subjective user evaluations and the likelihood of re-use of services. This encompasses whether users perceived a change in their condition as a result of their care. These factors highlight the recursive nature of access by explicitly describing how the process of care can influence subsequent access.

This thesis conceptualises access by describing the factors (barriers and facilitators) influencing access. By viewing access through this lens, it allows for the clear identification of specific barriers to access within empirical research [109, 118]. It considers access in its most comprehensive form by including factors that are associated with the individual, those that are associated with the service, those associated with the outcome of service use and wider contextual factors. It therefore acknowledges the multilevel and recursive nature of access. This is especially important when evaluating online services for STI testing because of societal level stigma around STI testing. Additionally, by acknowledging the recursive nature of access, this thesis can investigate how the experience of using a new service, such an online service, influences subsequent service use.

Table 2-1 Major Definitions and Conceptualisations of Access to Services Since the 1960s

Author(s) and year	Definition	Conceptualisation
Andersen 1968[100]	Access as use of health services	To achieve access a family must have predisposing components, enabling components and need components.
Bashshur et al. 1971[102]	Attendance at a health service	Accessibility as the functional relationship between the population and medical facilities and resources, and which reflects the differential existence either of obstacles, impediments and difficulties, or of factors that are facilitators for the beneficiaries of healthcare.
Donabedian 1972 [101]	Proof of access is in the use of the service, not simply its presence	Access in relation to need. There are two components in service use, service initiation and service continuation. Barriers to access are financial, psychological, social, organizational, spatial, temporal and so on.
Salkever 1976 [103]	Receipt of physical examination	A combination of physical and financial accessibility leads to access.
Aday & Andersen 1974 [104]	Access as entry into the healthcare system	Access is influenced by health policy, characteristics of the health delivery system, characteristics of the population at risk, use of services and consumer satisfaction.
Penchansky & Thomas 1981 [117]	The fit between the patient and the healthcare system i.e. moves away from defining access as use or entry	It builds on Andersen's enabling variables – Specifically focusing on availability, accessibility, accommodation, affordability and acceptability.
Andersen et al. 1983 [105]	Potential or the ability of access services and realised or actual access	Potential access consists of system level and individual level determinants. Realised access consists of use and subjective satisfaction.
Dutton 1986 [107]	Utilisation of services	Utilisation viewed as the product of patients' characteristics plus provider and system attributes.
Frenk 1992 [106]	Access as the ability of the population to seek and obtain care Access is restricted to phenomena that are related to accessibility but not equivalent to it	Accessibility is the degree of adjustment between the characteristics of healthcare resources and those of the population within the process of seeking and obtaining care. It is comprised of need for care, desire for care, initiation of care and continuation of care

Aday et al. 1993 [111]	Potential or the ability of access services and realised or actual access	Access consists of primary determinants of health behaviour, the health behaviour and the health outcomes.
Andersen et al. 1995 [113]	Potential or the ability of access services and realised or actual access	Access is influenced by the environment, population characteristics, health behaviour and outcomes.
Margolis et al. 1995 [114]	The timely use of personal health services to achieve the best possible outcomes.	Views access according to its barriers (structural, financial and personal), use of services, mediators and outcomes of service use.
Rogers et al. 1999 [116]	Providing the right service at the right time in the right place	Access is influenced by system level factors, knowledge and health professionals.
Guildford et al. 2002 [98]	Not explicitly defined	Access can be assessed in terms of health service availability, health service utilisation, or health service outcomes. No one of these dimensions is sufficient in its own right.
Andersen et al. 2001 [97] *	Potential or the ability of access services and realised or actual access	Access is influenced by contextual characteristics, individual characteristics, health behaviours and outcomes.
Shengelia et al. 2003 [99]	Coverage: probability of receiving a necessary health intervention, conditional on healthcare need Utilization: quantity of healthcare services and procedures used	Provision of health services can be evaluated more comprehensively through the measure of coverage. It provides a stronger basis for identifying the contribution of health services to major health system goals, such as population health.
Peters et al. 2008 [115]	Timely use of service according to need	Access includes both supply and demand elements. The notion of fit between users and services is identified. Access is comprised of geographical accessibility, availability, financial accessibility and acceptability.

*** This reference was updated in 2007 and 2014.**

EQUITY OF ACCESS TO SERVICES

Equity of access to health is one of the founding principles of the NHS and remains a central focus of health policy [120, 121]. It remains an important focus of the health agenda because extensive differences in health between groups are found across the UK [121, 122]. Not only does this have moral and ethical implications, but also economic implications as sizable sections of the population are left unable to work or achieve their full potential [110]. *Equitable access* is a notion made complex due to three central reasons [119]:

1. Access to health services is a complex concept, composed of multiple factors, that has been interpreted in a variety of ways among authors in the field [109, 119].
2. Equity of access is a complex concept. Not all differences in access are unfair. Some differences in access between groups may be acceptable, or unavoidable, while others are unnecessary or unfair. What constitutes unfair differences in access varies between contexts [110, 119], therefore what constitutes equitable access also varies between contexts.
3. Different types of health services differ greatly from each other; therefore, equity of access to services should be described in relation to the services to which access is required [119].

Equity of access to services is important within sexual health because there is consistent evidence that risk of STIs differs between different population groups. Access to STI testing differs between different population groups and morbidity from STI infection affects certain groups more so than others [24, 123]. In addition, because STI testing services are open access, access is driven by how users identify their need. Therefore, if users identify their need for services differentially there is potential for inequity. Because of these differences, the impact of delayed detection of infection and subsequent morbidity affect other aspects of health and well-being and impact on quality of life for certain population groups more than others.

The following section describes the various ways in which equity has been defined and conceptualised. It sets out how this thesis will define and describe equity of access to services for the study of access to online services for STI self-sampling at home.

2.3 DEFINING EQUITY OF ACCESS

The WHO defines equity as the absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically [124]. This thesis is specifically concerned with equity of access to health services. It is therefore concerned with equity of the provision and distribution of health services, rather than the level and quality of health of the population. It defines equity of access to services as the absence of avoidable or remediable differences in access to services among groups of people, whether those groups are defined socially, economically, demographically, or geographically [124].

2.4 CONCEPTUALISING EQUITY OF ACCESS

Equity in health is an ethical concept that is based on the principles of distributive justice [125]. There is a need to distinguish what is considered equal access and what is considered unequal access. Equity and

equality are two concepts that are often confused, possibly because they are almost homonyms. Equity of access refers to equal potential access to services for equal need of services, while equality of access refers to the same access for everyone [110, 112, 120, 126]. Therefore, the evaluation of equality of access can be made by an observation of the distribution of access, whereas the evaluation of equity of access requires the coupling of observation of the distribution of access with value judgements about users (and non-users) needs for service access [120]. This thesis is concerned with *equity of access*.

Aristotle's formal theory of distributive justice makes the distinction between two dimensions of equity, vertical and horizontal equity [127]. Horizontal equity refers to equity between people with the same health care needs, whilst vertical equity refers to those with unequal needs who should receive different or unequal health care [127]. This thesis asks the question *'do people who have similar need have similar access?'*. Therefore, the focus of this thesis is on horizontal equity.

Achieving the goal of equity is interpreted in different ways by different disciplines. For example, health economists might be concerned with the equity goals of equal expenditure capita or attempting to achieve the ambitious target of equal health status for all [120]. The target of equal health status for all may initially seem appealing, however, in practice policies attempting to achieve this place too many restrictions on how people would live their lives [120, 126]. Instead, aiming for less unequal health outcomes is more appropriate [126]. In the field of public health, the goal of equity is often referred to as either:

- equal access to available care for equal need

or

- equal utilization for equal need; [110, 112, 119, 120, 126]

In this thesis, equity is referred to as equity with the goal of achieving equal *potential* access for equal need. This definition combines these two goals to allow for variations in use that are a result of acceptable reasons. However, to understand this concept of equity, first there is a need to define what is meant by the term *need* in equal access for equal need, and how it relates to the context of online services for STI self-sampling at home is required.

2.5 DEFINING NEED

Like the concepts of access and equity, the concept of need in health services is multifaceted and lacks a universally accepted definition. The need for health services is a narrower concept than the need for health and lies on the pathway of need for health. The need for health services exists when an individual experiences ill health or, requires preventative or diagnostic health services. This thesis is focused on need for STI testing services. These services are secondary care services for diagnosis. In 1972, Bradshaw described four types of need applied to the need for health services [128]:

- Normative need: need defined by experts such as the need for screening or vaccination. This may vary between experts.
- Felt need: need perceived by an individual (perceived need). This is limited by knowledge of services.

- Expressed need: need that is expressed by seeking health.
- Comparative need: needs expressed by an individual or group of individuals after comparing their services to another individual or group of individuals.

Need may be discussed on an individual or a population level. Need may also be distinguished by whether it is viewed in terms of the individual or populations' initial health, or by their capacity to benefit from the service [129]. However, this differentiation is less relevant when considering need in terms of preventative/diagnostic services for STIs where the two are difficult to differentiate because services are often used when the user is asymptomatic and all STI diagnoses can benefit from treatment [130].

For the purpose of this thesis, which focuses on diagnostic services for STIs, normative need will be considered according to known risk factors for STI [98, 131]. Need for STI testing in the UK varies by ethnicity, age, and sexual preference [24]. STI rates are highest among MSM, individuals aged under 25 years and black African men and women who have condomless sex [11, 132].

This thesis also considers felt need. It will be described as perceived need for STI testing and use perceived risk of STI as a proxy measure of perceived need. This measure of felt need is subjective and is limited to use at an individual level. It may be subject to vulnerability to systematic variation between different groups of individuals [121]. Nevertheless, self-reported morbidity or risk is used extensively within empirical studies of equity and is considered a valid measure of felt need [133]. Additionally, there is evidence from a cross sectional survey in the UK (Natsal-3) that higher levels of STI risk perception is associated with greater use of STI related health services [134].

Expressed need is referred to in this thesis. Within the context of STI testing in clinics, expressed need includes circumstances that individuals attend a clinic for a test, regardless of whether they receive a test [128]. In the context of STI testing online, expressed need includes any order of a test, regardless of whether this test is returned by the individual. Comparative need is not discussed as it is outside of the scope of this PhD to compare individuals or geographical areas for whom the online service is not available.

APPROACHES TO EVALUATING EQUITY OF ACCESS

The evaluation of equity access provides three key benefits [97]:

1. Allows for the prediction of use of services
2. Promotes social justice
3. Improves the effectiveness and efficiency of health service delivery [97]

When new services are introduced, monitoring equity of access is essential to ensure services do not further deepen existing inequities in access [110, 126]. It is particularly important when the new services use new technologies which offer access solutions that risk catering for segments of the population [110]. The importance of monitoring equity of access is stressed further when services are introduced during times of economic difficulty, when resources are being reallocated or restricted [110, 135]. Because access is not merely the availability of a service, its evaluation requires more than counting physical services. There are two ways to measure access to services:

1. Measuring outcome indicators
2. Measuring process indicators.

These approaches both have strengths and weaknesses which are described in the paragraphs below.

Measuring outcome indicators involves measuring utilisation rates (realised access) or satisfaction indicators. This approach uses realised access as a proxy for access. It is attractive because it is relatively easy to obtain objective measures of realised use through routinely collected service data and report on the characteristics of the individuals accessing the service [104]. However, by focusing on outcome indicators, there is a failure to take account of consumers' willingness to seek care [136] and this may lead to underestimating the extent to which services are accessible by ignoring those with potential, but not realised access [118, 121]. Additionally, only measuring outcome indicators makes it difficult to distinguish between factors influencing access that are associated with the characteristics of the individual and those associated with the service, and therefore may not lead to clear policy implications [121].

The other approach to evaluating access is to investigate the process of access. This, more complex approach, may involve the measurement of potential access, realised access or an investigation into how the user interacts with the service. Measuring the process of access allows for a better understanding of the relationship between the characteristics of the population and the characteristics of the service. The type of information that this evaluation can produce lends itself to the development of practical solutions for improving access to services. For example, investigating the process of access may identify that access is limited because individuals are not aware that the service exists. The results of this investigation could then lead to clear practical solutions around information dissemination.

Neither of these approaches is perfect. Because of the nature and the number of measurements required, it is more resource intensive to measure process indicators. Measures of potential access may rely on self-reported data which could be prone to an overestimation of potential access due to courtesy bias. Solely measuring process indicators does not show whether people who want to get into the system actually do get in, therefore some outcome measures are needed to indicate whether access occurs [137]. What is measured can be further complicated by financial constraints and political and service delivery context. It is relatively easy to obtain objective measures of realised use through routinely collected service data [104, 121]. Because of this, access is increasingly measured as actual use (and reuse) of a service in the monitoring an evaluation of health services [97, 101, 106, 109].

This thesis exploits existing data and collects primary data to evaluate both outcome and process indicators of access. It measures users' willingness to seek care and therefore their potential access, as well as a validation of this by measuring realised access through outcome indicators.

2.6 INTERPRETING DIFFERENCES IN ACCESS

Because this thesis is concerned with equal potential access for equal need, if differences are found in the rates of service use by different groups, it does not automatically mean that the differences are inequitable.

A careful interpretation is needed to evaluate the goal of equal access for equal need. This consists of both moral and ethical dimensions because it is concerned with differences of access that are deemed acceptable/necessary and those deemed unfair or unjust [110]. Conversely, inequity refers to differences in access that are both unnecessary or avoidable and unfair or unjust [110]. What constitutes equitable and inequitable access differs between context and relies on judgement. Because this relies on judgement, there is a lack of agreement on what inequalities are unnecessary, avoidable, unfair and unjust and therefore inequitable.

Interpreting which differences account for unjust or unfair should occur within a context of health service delivery. According to the WHO, differences in utilisation of services between groups that are a result of:

- natural or biological variation
- user choice
- early/late adoption patterns

are fair or necessary [110].

While differences in utilisation of health services that are a result of:

- health damaging behaviours where choice is restricted
- a lack of health resources or social exclusion

are avoidable and unfair [110].

An example of natural or biological variation in access to services that is acceptable and fair, is the differences in access to cervical cancer screening between men and women. This difference would be expected, whereas a difference in access to cancer treatment services between men and women would not.

When two types of service that deliver the same care are available, differences in access between groups that are influenced by user choice are acceptable. For example, if two hospitals offered mammogram services and some groups preferred one hospital over the other. Concerns about equity would arise if the reason some groups used one hospital over the other was because they could not access the other hospital. User choice to not access a service at all may also be acceptable. An example of when user choice to not access any service is acceptable is if a section of the population chooses not to use a service because of religious beliefs, such as Jehovah's Witnesses lack of uptake of blood transfusion services. However, if certain groups are not accessing services, investigation is required to understand whether the reason for non-use is a result of user choice, or unfair conditions. The WHO also defines the differences in access between groups that are caused by late or early adoption of new services or technologies as acceptable. However, these should be closely monitored to identify if these differences continue once the service is established.

Further examples of inequity include differences in access to preventative services caused by lack of available services or knowledge of services. Finally, and possibly the most obvious example of inequity of access to services is social exclusion. An example of which comes from Amsterdam and Poland where higher levels of access to services among wealthier social groups were seen in times of service shortages [135].

Even with the guidance prescribed by the WHO, the process of judging which differences in equity are acceptable and fair and which are unacceptable and unfair remains far from straightforward. The factors influencing access to services are not mutually exclusive and often interact with one another. The main test of whether differences are fair or not depends on whether the differences in access are caused by something that the potential user chose or whether the lack of access was caused by something that was out of their control such as lacking resources or lack of ability to access [110, 112, 120, 126].

If differences in access between groups are observed, further investigation is needed to ascertain why the use for services are different [113]. Behavioural science theories bring together a broad range of perspectives from health, social and behavioural sciences to help understand behaviours in health such as access [138]. Because realised access, or entry to a service is a behaviour, behavioural models for access to health services can be a useful tool to help investigate which factors are influencing access to services and differentiate those that are equitable and those that are inequitable.

BEHAVIOURAL MODEL FOR ACCESS TO SERVICES

Because access to sexual health services for STI testing involves multiple dimensions of access, equity and need, models for health service use provide a useful tool for organising ideas around access to services. They provide a systematic approach to understanding the complexities of health behaviour, events and situations by proposing pathways for which the factors influencing access to services act [139, 140]. They are therefore particularly useful when thinking about the evaluation of services because they propose mechanisms by which access is facilitated or impeded [138, 141].

2.7 METHODS OF IDENTIFYING A BEHAVIOURAL MODEL

Identifying the appropriate behavioural model to use for evaluating access to STI self-sampling at home required the careful consideration of multiple aspects of the research question and the definition and conceptualisation of access and equity. These factors included:

1. The definition of access used within the thesis
2. The thesis approach to evaluating both process and outcome indicators
3. Whether the model should explain access or model changes in access
4. How the model defined and differentiated the service and the individual
5. Whether the model identified the multilevel and recursive nature of access
6. How the model could be used to describe equity of access

7. How the model could be used to describe equity of access within a context of choice of service type [138, 142]

Through the process of defining and conceptualising access to health services described in this chapter potential models were identified. Further models were identified through reviewing the existing literature on behavioural models for health promotion and disease prevention.

2.8 BEHAVIOURIAL MODELS

No single model dominates the literature for preventative behaviours; rather many models and adaptations of these models are used within different contexts and across different disciplines. These models are applied in research to either understand the promotion or prevention of behaviours, explain behavioural initiation or maintenance, and/or to inform the development of behavioural interventions. Models such as the theory of planned behaviour [143], the theory of reasoned action [144] and the transtheoretical model of behaviour change [145] have been used extensively across disciplines [146-148]. They have also been used in studies investigating access to STI testing [149-151]. However, these models focus on the factors relating to an individuals' behaviour and are less focused on the environmental or service related factors [146, 152, 153]. Models focused on health interventions such as the Acceptability Framework are suitable for guiding the assessment of acceptability of an intervention but fail to take in to account dimensions of access to health care such as approachability; availability and accommodation; affordability; appropriateness [109, 154]. Therefore, in the context of access to services, these models lack scope to describe how the service itself can influence the process of access.

Within the field of access to health services several conceptual models for access exist [100, 101, 106, 109, 112, 113, 117, 155, 156]. These models acknowledge that there are two groups of actors on access, those from the individual or population and those from the service or context. Andersen and colleagues expanded this two-part structure of access by identifying five key components; health policy, characteristics of the population, characteristics of the service, utilisation of the service and satisfaction [100]. Roy Penchansky went on to offer an alternative view of access as the fit between the user and the service and identified five dimensions of access; availability, accessibility, accommodation, affordability and acceptability[117]. Julio Frenk then extended Penchansky's work by clarifying terms often used interchangeably and developing domains of access; access, availability and accessibility [106].

However, one model has dominated the literature on access to services [156, 157]. Andersen's Behavioural Model for Access to Medical Care was developed in the 1960s for the purpose of providing a tool to investigate the factors that influence access to health services [100]. It has been used more frequently than any other model for access to care and its breadth of application across multiple disciplines has been noted in multiple reviews [156, 157]. Importantly, the model has been used extensively within empirical studies of access, as a tool to identify and explain the mechanisms of the barriers and facilitators to access to care [156].

The reason the model is so dominant is because it offers the most comprehensive view of access by addressing its multidimensional nature. It views access through the factors that influence access including the characteristics of the service, the characteristics of the individual, the wider context of service delivery and acknowledges the influence of service use on future use. It emphasizes the dynamic and recursive nature of health services use and includes process indicators, a measure of need and outcome indicators [113]. The model includes multiple influences on health services' use and subsequently on health status with reference to feedback loops and how service use can influence subsequent service use behaviour [113]. Importantly, it can be used as a tool to differentiate equitable from inequitable access to care.

This thesis uses this model as a lens through which it can view access. It does this by using the model to organise the factors, which act and interact to influence access to online services for STI self-sampling at home. It also draws on Andersen and colleagues' work to use the model to help judge equity of access to services within this context.

2.9 THE BEHAVIOURAL MODEL FOR ACCESS TO MEDICAL CARE

The following section describes The Behavioural Model for Access to Medical Care (Andersen's model) and describes how the thesis uses the model to make judgements about equity of access to online services for self-sampling at home.

The Behavioural Model for Access to Medical Care was initially developed by Ronald Anderson in 1968 as part of his PhD thesis submitted to Purdue University titled 'Families' use of health services: a behavioural model of predisposing, enabling and need components' [100].

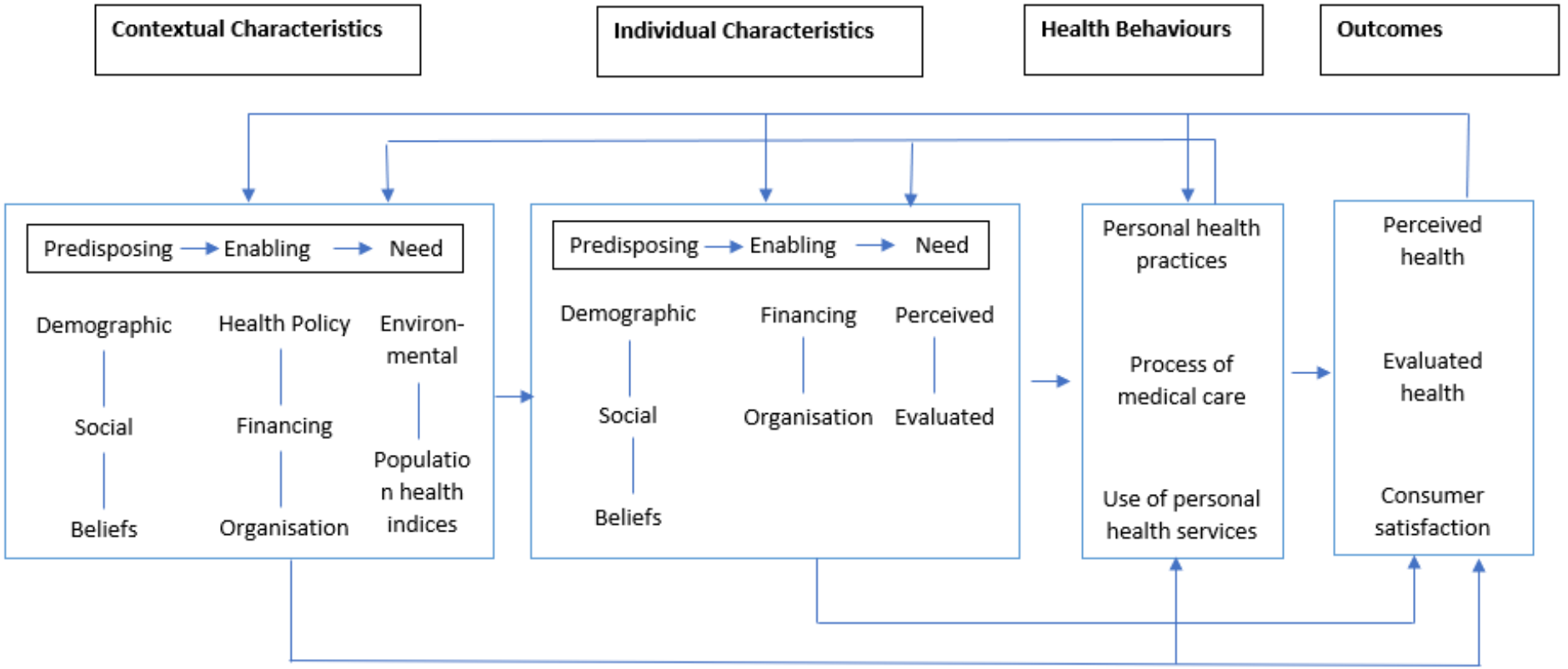
1. There must be a *predisposition* to receive medical care
2. There must be *enabling* conditions that allow one to attain health services
3. There must be a *perceived a need* for these services

It has undergone a large amount of critique [113, 158] and, as a result of the critique coupled with the authors' further development of the model, six revisions of the model have been made over the course of 50 years [97, 113, 155]. The components of the model (predisposing, enabling and need) have remained at the core of the model, although revised versions of the model have expanded it to include wider determinants of access such as societal and contextual influences [113]. The unit of analysis of the model has since shifted from the family, to the individual [113]. Figure 2.1 shows the current version of Andersen's Model for Access to Medical Care (Figure 2.1).

The current model is a multilevel model that can be used to investigate access to services at for individuals or among groups of individuals. It considers the contextual characteristics, individual characteristics, health behaviour and outcomes as factors that act and interact to influence an individual's access to health services. An important aspect of Andersen's model is that it explicitly shows how each factor interacts with another, depicted by feedback arrows [137]. By illustrating the importance of feedback, the model can be used to provide insights about how access might come to be improved [97].

A central goal of the model is to provide measures of access to services [104]. Andersen and colleagues aimed to produce a framework that could be used to theoretically and empirically evaluate access to services. They were successful in doing so as the model has been used extensively in empirical studies [158], and is considered the dominant framework among the authors debating the conceptualisation of access [109]. There are multiple reasons why this model is so extensively used in empirical studies. One being because it describes many aspects of access, which can be measured using routine collected objective data. Additionally, the model is highly adaptable to different contexts [158].

Figure 2.1 Andersen's Model for Access to Medical Care [137]



2.9.1.1 DESCRIBING THE COMPONENTS OF THE BEHAVIOURAL MODEL FOR ACCESS TO MEDICAL CARE

The most recent version of Andersen's model, published in 2014, consists of four major components: contextual characteristics, individual characteristics, health behaviours and outcomes [97]. Each of these components consist of several subcomponents, which are named within each box. Each subcomponent is then described in detail within the literature published with the models [97, 100, 104, 105, 113, 137, 155].

The model is described as multilevel because it consists of factors that act at an aggregate level for contextual characteristics, and those that act at an individual level for individual characteristics, health behaviours and outcomes. The interaction between these four components is depicted the arrows between them. The arrows on the model show the multidirectional nature of the factors that influence access and describe the feedback loops that further enable or impede access. The model therefore views access as a continual process, rather than a single entry into health services. The following section describes each of the four components of the model in greater detail.

2.9.1.1.1 CONTEXTUAL CHARACTERISTICS

The contextual characteristics include the environment in which health service access is being viewed. By including this component, the model recognises not only the characteristics of the service, but the characteristics of the community and other structural factors that influence access to services. The model suggests that this includes the health services, provider characteristics, characteristics of the community and characteristics of the family of the individual. These factors are measured at an aggregate level. These aggregates may be as small as those acting at a family level, or as large as those acting at the level of the national health service[97]. Individuals may be influenced by these factors because of their family, where they live or the people they chose to spend time with.

The three subcomponents of the contextual characteristics include:

1. Pre-existing conditions that *predispose* individuals to use services
2. Conditions that *enable* or impede use of the service
3. Conditions that the public or healthcare providers view as requiring *need* for services [97].

Contextual factors that may predispose a community to use services include *demographic structures* such as age structure within a community or gender ratio; *social characteristics* of the community such as employment level, crime rate and ethnic composition; and *beliefs* including underlying community or organisational values, such as beliefs about screening or stigma about STIs [97]. This thesis describes community demographic and social characteristics captured within routinely collected data such as census data. Community beliefs are not usually included in routinely collected data, however, alternative methods such as qualitative studies or surveys are used to measure and describe these [159, 160].

The contextual factors that could enable a community to use services include *health policies* acting at all levels, from local to national levels; *financing characteristics* which include the resources potentially available to pay for health services; and the *organisational context* which includes the amount and distribution of health services and personnel [97]. Within the context of sexual health, this may include the sexual and reproductive health budgets and the commissioning of services at a local level. This aspect of

access is subject to political influence and is the focus of health economists. While it is out of the scope of this thesis to measure the impact of these, it discusses the financial and organisational context that existed during the time that access to services was measured.

The contextual characteristics relating to need include *environmental health* related measures of the physical environment, including quality of housing, air and water; and *population health indices* such as prevalence of HIV or rates of STI infection within a community [97]. This thesis describes these by describing the physical and geographical context in which the target population live, and the epidemiology of STIs within the context.

The arrows in the model indicate that contextual characteristics influence access to services through the influence they have on individual characteristics. They also have direct influence on access, such as when additional services are introduced, this in itself can increase use. The arrows also indicate that contextual characteristics influence satisfaction with services and outcomes of service use. This refers to the influence of community beliefs on perceived health [97].

2.9.1.1.2 INDIVIDUAL CHARACTERISTICS

The individual characteristics describe the individual who is accessing services. These, and how they result in use of services (health behaviours) and health outcomes and satisfaction with services (outcomes) are the ultimate focus of the model. Like the contextual characteristics, individual characteristics have three subcomponents. These include:

1. Individual characteristics that *predispose* use of services
2. Individual characteristics that *enable* or impede use of services
3. An individual's *need* for services

The individual factors that may predispose someone to using a service include *demographic factors* such as age and gender; *social factors* that determine a person's ability to cope with the presenting problem and command resources to deal with the problem, including education or occupation and; *health beliefs* such as attitudes, values and knowledge of health services [97]. Like the contextual predisposing characteristics, many individual predisposing characteristics relating to demographic and social factors are often collected routinely. This thesis utilises these routinely collected data where possible to describe access. It will also consider predisposing characteristics such as health beliefs by utilising alternative methods of measurement.

The individual characteristics of a person which may enable access to health services include; their *ability to pay* for services financially (relevant for private health services) and; the *organisation* of the service, whether a person has a regular source of healthcare available and what the personal costs of using the service are including travel time, time off or work or waiting time [97]. Within the context of sexual health service delivery in the UK, where the services are delivered free of charge, this thesis considers how the organisation of the service enables or impedes use.

The individual need for health services characteristics a person may have can relate to a person's *felt need* (how someone views their own health needs or functional state) or their normative *need (a professional*

judgement of need or an objective measure of need) [97, 128]. The thesis considers both types of need. It utilises demographic indicators of risk to describe normative need, and measure felt need at an individual level. Expressed need is described through entrance to services.

The individual characteristics within the model are the most researched characteristics within empirical studies using Andersen's model. Of these the most frequently measured are predisposing characteristics such as age, gender, marital status and ethnicity, perhaps because they are most easy to obtain [158]. The arrows in the model show how individual characteristics act on health behaviours directly and indirectly, outcomes directly and indirectly and how they're influenced directly by contextual characteristics (Figure 2.1).

2.9.1.1.3 HEALTH BEHAVIOURS

The model refers to health behaviours that are personal practices performed by an individual that influence health status. It refers to three aspects of health behaviours as having an influence on service use. These include *personal health practices* such as whether someone adheres to medical regimens, their diet and lifestyle or whether they practice self-care; *the process of health care delivery* including the process of care, and the quality of provider-patient communication; and finally, the actual *use of personal health services [97].* This extends the use of the model to preventative behaviours such as exercise.

Within the context of this thesis, health behaviours refer to the use of services for STI testing. This includes the process of ordering a test online and the interaction between the user and the online service. Finally, realised use of personal health services, or entry to the health care service is used as an outcome measure of access to sexual health services.

The arrows on the model indicate how health behaviours are directly influenced by individual characteristics, directly and indirectly influenced by contextual characteristics and directly influenced by outcomes (Figure 2.1). The direct influence by outcomes indicates previous service use has a direct influence on subsequent use of services.

2.9.1.1.4 OUTCOMES

Later developments in the behaviour model have explicitly acknowledged the influence of an individual's experience with a service on subsequent service use by including a box for 'outcomes'. Outcomes of health service use relate to someone's *perceived health*, their *evaluated health* and their level of *satisfaction* with the health services. This thesis considers the influence of outcomes in relation to satisfaction with services and subsequent use of services.

The arrows on the model indicate that an individual's health outcomes are influenced directly and indirectly by contextual characteristics, directly and indirectly individual characteristics and directly by health behaviours. They also show how outcomes of health service use feedback and influence contextual characteristics, individual characteristics and health behaviours (Figure 2.1).

2.10 USING THE MODEL TO MAKE JUDGEMENTS ABOUT EQUITY OF ACCESS

Andersen's model offers one lens with which to view access that helps make judgements on which factors influence access to services, result in equity of access and which factors result in inequity of access. It does not offer a definitive list of those factors, which result in equitable access and those that result in inequitable access. Instead, the model can be applied within a particular context and be used to help make judgements about which components explain equitable access to services and which components contribute to inequitable access to services [113].

Anderson traditionally defined equitable access as when demographic and need variables explain most of the variance in use [100]. He suggested that inequitable access occurs when social structure (e.g. ethnicity), health beliefs and enabling resources determine who accesses services [100]. More recently, Andersen and colleagues have softened their approach to judging equity suggesting that 'equity of access to medical care is the value judgment that the system is deemed fair or equitable if need-based criteria are the main determinants of whether or not—or how much—care is sought' [113]. Therefore, the model can be utilised to identify which components are influencing access, and whether needs-based criteria have the largest influence on access.

The model is also helpful when trying to understand how service innovations may influence access to health services. The model posits that certain variables that influence access to services can be 'mutable' or changed by policy [113]. The mutability of a variable refers to how easy or difficult it is for policy or service innovations to change that variable to increase access. The less mutable something is, the more difficult it is for policy or service innovations to influence it. The more mutable something is the easier it is for policy or service innovations to influence it.

By differentiating factors associated with the context and those associated with the individual, the model is able to differentiate factors that are associated with the service [97]. In many contexts, factors associated with the service are relatively mutable compared to factors associated with the individual or society. For example, access limited by low levels of trust caused by a lack of branding within a service can be altered by improving the branding of a service. Demographic variables such as age and gender have low levels of mutability as these cannot be changed to increase access. Social structure, which is often measured using proxy observable factors such as education, occupation and ethnicity has low levels of mutability as policy that influences social structures is not a reasonable short-term goal [113]. It is possible for service innovations and health policy to influence individuals' health beliefs; therefore, these are moderately mutable [113].

Enabling variables are highly mutable. For example, changes to enabling variables such as cost of services, opening times, waiting times and volume of services available are achievable with service innovation and policy changes. Changing perceived need for health services is possible through education and information campaigns therefore these are moderately mutable. Evaluated need can be changed through changes in medical guidelines, although this should not be done purely to increase access. Rather any changes to evaluated need should be carefully considered, therefore these have low levels of mutability [113].

Andersen's model does not offer a simplistic solution to judging equity of access to services. Any model that claimed to do so would be reductive of what is a complex and contextual judgement. Instead, Andersen and colleagues offer a way to view access that identifies the component influencing access and helps to differentiate those that are associated with need and those that are not. It also helps to operationalise research relating to access by defining which components are more and less 'mutable' or influenced by policy, and therefore the components which policy can focus on to improve access.

CHAPTER SUMMARY

Given the multifaceted dimensions of access, equity and need, and how these differ between contexts, it is not surprising that there is a lack of consensus on the appropriate way to evaluate equity in access to services [161]. This chapter conceptualised the notions of access to services and equity of access to services and positioned the concept of equity of access used in this thesis within the wider literature. Table 2-2 summarises the definitions and conceptualisations of access and equity that will be used in this thesis.

This chapter also described how this thesis will evaluate equity of access to services. To investigate access, this thesis will measure users' willingness to seek care and therefore their potential access, as well as a validation of this by measuring realised access through outcome indicators. This thesis uses Andersen's model as a lens through which it can view access and evaluate it. It does this by using the model to organise the factors which act and interact to influence access to online services for STI self-sampling at home. It also draws on Andersen and colleagues' work to use the model to help judge equity of access to services within this context.

Table 2-2 Thesis Definitions and Conceptualisations of Access and Equity

Concept	Definition	Conceptualisation
Access	Users' *ability* or *willingness* to enter and use a service (potential or realised) in relation to need for services [97].	Access as the factors that influence use of services. This includes those that are associated with the context, those that are associated with the individual, those associated with the health behaviour and those associated with the outcome of service use [97].
Equity	The absence of avoidable or remediable differences in access to services among groups of people, whether those groups are defined socially, economically, demographically, or geographically [110].	Equity is referred to as equity with the goal of achieving equal *potential* access for equal need [110]. Horizontal equity is considered.

Chapter 3 SCOPING REVIEW OF THE FACTORS INFLUENCING ACCESS TO ONLINE SERVICES FOR SELF-SAMPLING AT HOME

INTRODUCTION

This thesis evaluates access to an online service for STI self-sampling at home. Chapter 1 provided the background information to set the scene for the evaluation. Chapter 2 conceptualised the notions of access to services and equity of access to services and positioned the concept of equity of access used in this thesis within the wider literature. This chapter presents a scoping review of the existing literature for access to online services for STI self-sampling at home. It investigates potential and realised access to online services and discusses the findings in terms of Andersen's Model for Access to Medical Care. It investigates access by investigating the factors that influence access. These factors include both barriers to service access and facilitators to service access. This review identifies gaps within the literature that this thesis can address and positions the thesis within the context of the wider academic community investigating access to online services for STI self-sampling at home.

AIM

The aim of this review is to summarise the existing literature for access to online services for STI self-sampling at home and identify the barriers and facilitators (factors) that influence access to these services.

METHODS

3.1 TYPE OF REVIEW

At the time of carrying out the review (2017) online services for STI self-sampling at home were a relatively new service innovation. Because of this, it was expected that there may be a limited amount of evidence available within existing literature. A scoping review was carried out to map the available literature in this field. Scoping reviews differ from systematic reviews in that they are used to identify parameters and gaps in a body of literature, rather than to formally assess the quality of studies and generate a conclusion [162]. They are often used for preliminary assessment of the size and nature of the existing evidence in the field [163-166]. In this thesis, a scoping review was employed to identify the breadth of literature available for STI self-sampling, allowing for more loosely defined inclusion and exclusion criteria to capture all the available literature in a newly developing field [163]. The objective of this scoping review is to identify the factors that influence access to online services for STI self-sampling at home.

3.2 SEARCH STRATEGY

A systematic search was carried out in January 2017 to identify the factors that influence use of online service. A comprehensive search of PubMed, PopLine, Scopus, EMBASE and PsycINFO databases was carried out using the search strategy presented in Appendix A. The search included studies from the year 2000 to 2017. Abstracts were included if full texts were not available. The search strategy was designed to be highly sensitive because of the expected paucity of research. The results from the search returned 631 potential titles. Further hand searching and searching of reference lists was carried out. The author

independently screened titles and abstracts for eligibility. Where full texts were not available, abstracts were included. The final review contains evidence from 37 studies.

3.3 SELECTION CRITERIA

Selection criteria were developed iteratively throughout the process of reviewing articles for study inclusion. This is recommended practice in scoping reviews [165]. Developing selection criteria iteratively enables criteria to be developed once the authors have become familiar with the literature [163, 165]. Inclusion and exclusion criteria were therefore developed post hoc. No protocol was published prior to carrying out the review.

3.3.1.1 INCLUSION CRITERIA

3.3.1.1.1 Type of publication and study type

The review was not restricted to a publication type. Because of the scope of the review question, the review was not restricted to a specific study type, therefore evidence from both primary qualitative and quantitative studies as well as reviews are included. Only studies published in English are included in the review.

3.3.1.1.2 Study setting

Studies from any high-income setting, focusing on studies carried out in the UK, Europe, Australia, Canada and the USA. Focusing on these countries allows for the comparison of evidence generated in settings with similar socio-cultural influences to the UK.

Reviews that included studies from low and middle-income settings were included, although this review highlighted the results they present from high-income settings.

3.3.1.1.3 Participant type

Participants of any age, gender, sexual orientation or ethnic group.

3.3.1.1.4 Type of service

Any type of STI testing service that offers either:

- Home-self-sampling via any type of digital service
  Home-testing via any type of digital service
- Clinic self-sampling
- Home-self-sampling
- Home-testing

Studies investigating intention to use a hypothetical STI testing service that offers either:

- Home-self-sampling via any type of digital service
- Home-testing via any type of digital service
- Clinic self-sampling
- Home-self-sampling
- Home-testing

Studies that do not investigate a STI testing service, but report on intention to use a type of STI self-testing service, self-sampling service or self-test or self-sampling technique.

3.3.1.1.5 Phase of implementation

Studies investigating services at any phase of development and implementation. This includes the studies reporting the theoretical development of a service, through to services that are up and running.

3.3.1.1.6 Study outcome

Use of, intention to use, willingness to use, acceptability of use, perceptions of use.

3.3.1.2 EXCLUSION CRITERIA

3.3.1.2.1 Study setting

- Any study set in a low or middle-income setting.
- Any review that only includes studies from low or middle income settings

3.3.1.2.2 Type of service

Any service that does not offer STI self-testing or self-sampling.

Any clinic-based service that does not offer self-sampling or self-testing.

Home based services that do not involve self-sampling or self-testing.

3.3.1.2.3 Study outcome

Not related to any online or STI self-sampling service or element of these services (such as self-sampling).

3.4 SUMMARY OF INCLUDED STUDIES

A summary of included studies form was developed and completed independently by the author. The form captures relevant information about the study type, time period, context, population and type of service being studied. It also includes whether the study was investigating an existing service or a hypothetical service, yet to be developed.

3.5 DATA PRESENTATION

A summary of the types of studies included, characteristics of participants and the characteristics of the service are presented in the first section of the results. A narrative review of the literature for the factors that influence use of online services for STI self-sampling at home is then presented.

The literature has been organised under two overarching headings:

- Factors relating to the individual using the services
- Context related barriers and facilitators to use

The organisation of the literature follows the Andersen model in terms of differentiating the factors relating to the individual and the factors relating to the context [97]. Within each of these headings the evidence that exists is organised to reflect the predisposing, enabling and need factors. Although the review differentiates individual and contextual factors, there is considerable crossover between them as access to services requires an interaction between the individual and the service. For example, a barrier relating to the individual accessing the service may be their ability to navigate the website, while the barrier relating to the service may be poor navigation pathways through a website. The review has been presented in this way to reflect how these factors were positioned within the literature.

RESULTS

3.6 STUDIES INCLUDED IN THE REVIEW

The review includes 37 studies that were published between 2009 and 2016. The characteristics of the included studies is available in Appendix B. Twenty-one cross-sectional studies (13 descriptive and eight comparative), eight qualitative studies, four reviews and four other types of studies are included. Of the 37 studies included, 18 refer to intended use of a service or hypothetical service. Most of the studies investigated STI testing services for HIV (13) or chlamydia (12). The review includes 14 studies that relate to an online service. A summary of the included studies in the review is available in Table 3-1. Meta-analysis was not possible due to heterogeneity between studies.

Table 3-1: Summary of included studies

First Author, Date	Study methodology, year	Country	Participants	STI	Service type	Delivery method	Kit type	Return of kit method	Results	Treatment available	Partner notification available	Cost to user	Potential or existing
Ahmed-Little, 2016	Pilot study 2011-2012	UK	>16 years	HIV	Online	Not stated	DBS self-sampling	Postal	Automated phone call or SMS	No	Not stated	No	Existing
Aicken, 2016	Qualitative interviews, 2012	UK	25 sexually experienced people aged 16-24 years in London	CT	Smartphone enabled liked to online clinic care	Not stated	Self-testing	n/a	SMS	Yes	Yes	No	Hypothetical
Alexander, 2008	Cross-sectional descriptive 2005-2007	UK	MSM	CT and GC	Clinic-self-swab	n/a	Self-sampling	n/a	n/a	n/a	n/a	No	Existing
Baraitser, 2015	Theory of change, 2013	UK	Stakeholders	HIV Sy, CT, GC	Online	Postal	Self-sampling	Postal	SMS	Yes	Not stated	No	Hypothetical
Bavington, 2013	Online cross-sectional descriptive	Australia	MSM	HIV	Not stated	Not stated	Self-testing	n/a	n/a	No	Not stated	Not yet known	Hypothetical
Bracebridge, 2012	Cross-sectional comparative, 2008-2009	UK	18-24 years	CT	Postal screening access via internet	Postal	Self-sampling	Postal	SMS or preferred method	Yes	Yes	No	Existing
Bull, 2015	Cross-sectional comparative, 2013	Not stated	Men and women that returned samples	HIV	Not stated	Postal	Self-sampling, saliva and blood	Postal	Not stated	No	Not stated	Not stated	Existing
Chai, 2001	Cross-sectional	USA	Men >14 years	CT, GC, Tri	Online targeting	Postal	Self-sampling	Not stated	Toll free number	Faxed to clinic	Not stated	Free	Existing

First Author, Date	Study methodology, year	Country	Participants	STI	Service type	Delivery method	Kit type	Return of kit method	Results	Treatment available	Partner notification available	Cost to user	Potential or existing
	descriptive, 2006-2009				higher-risk groups								
Chui, 2016	Cross-sectional descriptive, 2010-2011	USA	MSM >18	HIV	Study- no service	Postal	Not stated	Not stated	Not stated	Not stated	Not stated	Free	Existing
Elliot, 2015	Cross sectional descriptive, 2013	UK	MSM	HIV	Targeting through SNS	Postal	Self-sampling HIV and saliva	Postal	SMS and phone	n/a	Not stated	Free	Existing
Fajardo-Bernal, 2015	Systematic review, up to May 2015	Not stated	Sexually active people	CT, GC	Home-based collection – no service	n/a	Self-sampling	n/a	n/a	Yes	n/a	n/a	Existing
Figueroa, 2015	Literature review, 1995-2014	Not stated	MSM, SW PWID, transgender, people in prisons	HIV	n/a	n/a	Self-testing	n/a	n/a	n/a	No	No	Both
Frye, 2015	Qualitative study, 2014	USA	Male MSM BME	HIV	n/a	n/a	Self-testing	n/a	n/a	n/a	Not stated	Yes	Hypothetical
Gaydos, 2006	Cross-sectional descriptive 2004-2005	USA	Females >14 years	CT	Online service	Postal or pick up	Self-sampling	Postal	Toll free call	Faxed to clinic	Not stated	Free	Existing
Gaydos, 2006	Qualitative, 2005	USA	Females	CT	Online	Not stated	Self-sampling	Not stated	Not stated	Not stated	Not stated	Free	Hypothetical
Gilbert, 2013	Cross-sectional	Canada	MSM	HIV/STI	Not stated	Not stated	Self-sampling	Not stated	Not stated	Not stated	Not stated	Not stated	Hypothetical

First Author, Date	Study methodology, year	Country	Participants	STI	Service type	Delivery method	Kit type	Return of kit method	Results	Treatment available	Partner notification available	Cost to user	Potential or existing
	descriptive, 2011-2012						and self-test						
Gkatzidou, 2015	Qualitative, 2013	UK	16-18 years and 19-24 years	CT	Smartphone enabled with testing and treatment	Not stated	Self-testing	n/a	System notifications	Yes	Yes	Free	Hypothetical
Greacen, 2012	Cross-sectional descriptive, 2009	France	MSM	HIV	Online (unauthorised)	Not stated	Self-testing	Not stated	n/a	n/a	Not stated	Not stated	Existing
Greacen, 2013	Cross-sectional, comparative 2009	France	MSM	HIV	Online	Not stated	Self-test	Not stated	n/a	Not stated	Not stated	Yes	Hypothetical
Greenland, 2011	Cross-sectional comparative, No date stated	Netherlands	16-29 years	CT	Online with invitation letter	Postal	Self-sampling	Not stated	Online	Not stated	Not stated	Not stated	Existing
Grispen, 2011	Cross-sectional comparative, no date stated	Netherlands	>12 years	HIV	Not stated	Not stated	Self-test	n/a	n/a	Not stated	Not stated	Not stated	Existing
Jamil, 2013	Systematic review, 2005-2013	Not stated	Not stated	CT, GC	Any program with self-collected CT and GC	Any	Self-sampling	Any	Any	Not stated	Not stated	Any	Existing
Krause, 2013	Systematic review, 1998, 2012	USA, Singapore, Spain	Not stated	HIV	Not stated	Any	Self-testing or	n/a	n/a	n/a	Not stated	Not stated	Hypothetical

First Author, Date	Study methodology, year	Country	Participants	STI	Service type	Delivery method	Kit type	Return of kit method	Results	Treatment available	Partner notification available	Cost to user	Potential or existing
		Malawi and Kenya					self-sampling						
Kuder, 2015	Cross-sectional descriptive, 2013-2014	USA	General	CT, GC, Tri	Online	Postal	Self-sampling	Postal	Internet, SMS, phone	Referral	Not stated	No	Existing
Kwan, 2012	Cross-sectional descriptive, 2010-2011	Australia	>16	CT	Online risk assessment and test order form	Collection	Self-sampling	Sample taken in centre	Toll free number	Referral	Yes	No	Existing
Lorimer, 2013	Qualitative, not stated	Scotland	Men aged 16-24 years	CT	Postal screening with invitations	Postal	Self-sample	Not stated	Not stated	Not stated	Not stated	Not stated	Hypothetical
O'Connor, 2016	Systematic review or qualitative studies, 200-2016	Not stated	General	n/a	Web based, m-health, SMS, IVR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Hypothetical or in development
Rompalo, 2013	Qualitative, 2008-2009	USA	>18 years	All	Point of care tests	n/a	Self-sampling	n/a	n/a	In clinic (POCT)	Not stated	Not stated	Hypothetical
Ronda, 2012*	Cross-sectional, comparative, 2006	The Netherlands	Not stated	CT	Home-test	Not stated	Self-test (?)	Not stated	Not stated	Not stated	Not stated	Not stated	Hypothetical
Powel, 2015	Cross-sectional comparative	UK	General	CT	Not stated	Not stated	Self-testing (?)	Not stated	Not stated	Not stated	Not stated	Not stated	Hypothetical

First Author, Date	Study methodology, year	Country	Participants	STI	Service type	Delivery method	Kit type	Return of kit method	Results	Treatment available	Partner notification available	Cost to user	Potential or existing
Sharma, 2014	Cross-sectional descriptive, 2012	USA	MSM >18 years	HIV	n/a	n/a	Self-testing and self-sampling	n/a	n/a	n/a	n/a	Yes	Hypothetical
Smith, 2016	Cross-sectional descriptive, 2011-2013	Australia	MSM, Men and women	CT	Home-based re-testing strategy	Postal	Self-sampling	Postal	SMS	Referral	Not stated	Free	Hypothetical
Spielberg, 2014	Feasibility descriptive	USA	Women	CT, GC, Tri	Online	Postal	Self-sampling	Postal	Online	e-prescriptions	Yes	Not in study	Existing
Tebb, 2004	Cross-sectional descriptive, 1999-2000	USA	13-20 years	CT	None	n/a	Self-sampling	n/a	Not stated	Not stated	Not stated	Not stated	Hypothetical
Van der Helm, 2009	Cross-sectional descriptive, 2006-2007	The Netherlands	General	CT GC	In clinic	n/a	Self-swab	n/a	Not stated	Not stated	Not stated	Free	Existing
Witzel, 2016	Qualitative	UK	MSM >18 years	HIV	Not stated	Not stated	Self-testing	n/a	n/a	n/a	Not stated	Yes	Hypothetical
Woodhall, 2012	Cross-sectional descriptive	UK	15-24 years	CT	Online	Postal	Self-sampling	Postal	SMS	Not stated	Not stated	Both free and financial cost	Existing

UK= United Kingdom USA= United states of America, HIV= Human Immunodeficiency Virus, CT= Chlamydia Trachomatis, GC= Gonorrhoea Neisseria Tri= trichomoniasis, Syp= Syphilis, MSM= men who have sex with men, SW = Sew worker, PWID= people who inject drugs, BME= black and ethnic minority groups, POCT= point of care test, SMS= short messaging service, STI= sexually transmitted infection * only abstract available

3.7 FACTORS RELATING TO THE INDIVIDUAL USING THE SERVICES

The following section summarises the existing literature relating to the factors associated with an individual that influence access to online services. These have been organised to reflect the different types of individual characteristics defined within the Andersen model as predisposing, enabling and need characteristics [167].

3.7.1.1 PREDISPOSING CHARACTERISTICS

3.7.1.1.1 DEMOGRAPHIC FACTORS

3.7.1.1.1.1 Gender

Three studies described how gender influenced use of an online service for STI testing, although the evidence for how gender influences use is inconsistent between studies. In a UK based observational study which evaluated a systematic postal screening service for chlamydia with remote clinic access via the internet, after adjusting for age and IMD, women were more likely to access the online service compared to men (aOR=1.40 95%CI 1.30,1.52 p=<0.001) [168]. In contrast, a descriptive analysis of NCSP data from England, a higher proportion of men accessed internet testing compared to women [16]. In a systematic review of home versus clinic sampling for chlamydia and gonorrhea which included 10 RCTs, nine of which used postal services for returning kits, for both women and men, higher proportion of participants returned specimens in the home-based than clinic-based group [169]. The review found no significant differences in the effect size between men and women, although the heterogeneity between trials was very high, therefore this should be interpreted with caution [169]. While there is some literature for the differences in access between men and women, there is a dearth of evidence relating to transgender access to online services in the UK.

3.7.1.1.1.2 Age

How age influences access to online services has been described in both qualitative and quantitative studies. Because internet use is high amongst young people and risk of STI infections is high, many qualitative studies have investigated the appeal of online service among this population [69, 170-173]. Young people routinely report high levels of acceptance of online testing in qualitative studies [170-172]. Three quantitative studies have investigated willingness to use online services between age groups. In Canada, an online survey of 7938 MSM that investigated the acceptance of online services for STI testing reported acceptance to be highest among MSM aged younger than 30 years old [84]. In The Netherlands, in a survey of users of internet based chlamydia screening, being aged 20-24 years old was associated with increased willingness to test regularly online in the future (p=<0.001)[174]. However, the actual use of online services by young people is not yet established. Analysis of NSCP data suggests that a higher proportion of people aged between 20-24 years use internet services, although this is not adjusted for potential confounding factors and it is not clear whether the differences between age groups are statistically significant [16]. In a cross-sectional study of a postal screening service for chlamydia via internet services, after adjusting for gender and IMD, the association between age and service use was weak (p=0.02) [168].

3.7.1.1.1.3 Sexual orientation

Evidence for whether, if and how sexual orientation may influence access to online services relates mostly to MSM. Several studies have reported high levels of acceptability of online services amongst MSM for both STI testing and HIV testing at home [175-177]. In an analysis of a Canadian survey that included 8388 participants that investigated intention to use online STI testing, compared to MSM, men who identified as straight were less likely to intend to use online services (OR=0.67 95%CI=0.50, 0.90 p=<0.05) and men who identified as bisexual were more likely to intend to use online services (OR=1.18 95%CI=1.04, 1.34 p=<0.05) [84]. The same study found that men who had not told their primary care provider about their male sexual partners were more likely to test online (OR=1.24 95%CI=1.10, 1.41 p=p=<0.05) [84]. One study presents evidence for how sexual orientation influences actual use of online services. In Australia, in a survey of 2306 MSM, the majority (67.4%) of respondents reported that the availability of home testing for HIV would increase their frequency of testing [175]. Evidence from a randomized controlled trial of home compared to clinic retesting for chlamydia three months following infection found that while overall, the majority (65%) of participants preferred the option of retesting at home, there was no significant difference in preference for testing at home between MSM, women and heterosexual men (p=0.916) [178].

3.7.1.1.1.4 Ethnicity

There is some evidence for differences in uptake of online service by ethnic group, although the evidence is not consistent between studies. In the USA, the 'iwantthekit' website which offers free of charge STI self-sampling kits for testing at home is predominantly accessed by people who identify as Caucasian and African American [90, 179], although this could be a reflection of the target population of the program rather than an indication of the population who prefer to use the service. In a cross-sectional survey of 217 women aged between 18 and 30 in California which investigated use of online services for STI testing and treatment, there was weak evidence that women who identified as African American were less likely to complete a test using the online services (aOR=0.29 95%CI=0.09, 0.82 p=0.023)[180]. Additionally, qualitative interviews with black MSM and transgender women in the USA suggest that barriers to HIV self-testing include the cost of the test, anxiety regarding accessing the test, concerns around correct test operation, and lack of support if a test result is positive [181]. In The Netherlands, in a survey of both users and non-users of an internet based service for chlamydia screening, being from a non-Dutch ethnic background was associated with higher likelihood of willingness to test online in the future (OR=1.5 p=<0.001) for users and (OR=1.5 p=0.025) for non-users [174].

3.7.1.1.2 SOCIAL AND BELIEF FACTORS

3.7.1.1.2.1 Education

Two studies report conflicting evidence about the association between willingness to use online services for STI self-sampling at home and a user's level of education. In The Netherlands, multivariate analysis of survey responses from 3499 individuals who used online services for chlamydia self-sampling at home, which adjusted for age, gender, infection and ethnicity those who reported that they were willing to test regularly again were more likely to have intermediate or low levels of education compared to a high level of education (OR=1.5, 95%CI 1.2,1.9 p=<0.001) [174]. However, in a multivariate analysis of 217 women who were offered the use of an online STI testing service from four counties in California, those with a high

school level education or less were less likely to complete a test using the online service compared to those with college or advanced degree (OR=0.22, 95%CI=0.10, 0.44, p=<0.001) [180].

3.7.1.1.2.2 Privacy and confidentiality

The increased level of privacy or confidentiality of information that online services can afford users is commonly stated as a facilitator of access [84, 176]. The terms confidentiality and privacy are often used interchangeably [182, 183]. Strictly, confidentiality refers to one's duty to keep information private and is part of a wider construct, the users privacy [182, 183]. Privacy refers to the right of an individual to keep their information from others and in the context of online services, often refer to social privacy (maintaining privacy from social contacts) and institutional privacy (the ability of an institution to maintain privacy, often relating to data security) [183]. Throughout this thesis, the term privacy is used when describing an individuals' need to conceal testing from others. Where appropriate it differentiates social and institutional privacy. Confidentiality is used to refer to the services duty to keep users' information private.

In a systematic review of 18 studies that assessed the attitudes and acceptability of HIV self-testing among key populations globally, among studies in developing settings, 12 of 18 studies reported privacy as a benefit of HIV self-testing [176], though no detail on the type of privacy was presented. In the UK, analysis of free text survey responses from an online service for HIV testing in Manchester, users felt that accessing HIV testing in this manner helped make testing a more comfortable process and therefore helped increase uptake of HIV-testing [184]. In France, a survey of internet using MSM found MSM who had not disclosed their sexual orientation to their social group were more likely to access online services for STI testing compared to MSM who were open about their sexual orientation (OR=3.90 95%CI=1.73, 8.76 p=0.001) [177]. Online services for STI testing may increase testing amongst those delaying testing because of privacy concerns. In a large Canadian survey of MSM, men were more likely to intend to use online services for STI testing if they had delayed or avoided testing the past 12 months due to concerns about social privacy (OR=1.65 95%CI=1.40,1.95 p=<0.05) [84].

However, while the remote access to testing may increase privacy in some ways, it could also reduce privacy by other means. Evidence from two studies involving focus groups with young people in London suggests that users of online service may be concerned about their social privacy, for example, concealing any evidence of STI testing or diagnosis from their mobile device or computer from family and friends. [92, 170]. These studies also highlighted that younger people may be less able to conceal evidence of testing on their phone, computer or mobile device than older people [170]. Similarly, focus groups with MSM in the UK investigating the barriers and facilitators to HIV self-testing found that HIV self-testing at home meant that the increased privacy that was gained by not having to access a clinic was challenged by a potential loss of domestic social privacy [185]. Interviews with African American MSM and transgender women the USA highlighted potential issues with private space at home for people to take the samples, this was considered more of a concern for young people [181].

Concerns about institutional data privacy could also be a barrier to accessing online services for STI testing. Participants in focus groups with young people in London voiced concerns about the privacy of the data that the service holds, worrying about who had access to this data [92, 170]. Evidence from a qualitative

review of the factors affecting patient engagement with digital health interventions indicates that engagement with digital interventions is dependent on whether patients and the public consider their data to be safe, secure and used appropriately by those who control and manage it [186]. Focus groups in Scotland exploring young men's views of the barriers and facilitators to internet screening for chlamydia revealed privacy concerns relating to all aspects of the service, although after clarification of the process, concerns were allayed. [172].

3.7.1.1.2.3 Trust

An individual's level of trust in an online service for STI testing appears to influence access. Trust may relate to trust in the service to keep data private (as discussed in relation to institutional data privacy in the previous paragraph), trust in the information that the service provides, trust in the accuracy of the test result, and trust in the postal service to return the samples, although some studies refer to trust generally, rather than differentiating these aspects. Evidence from a systematic review of evidence for the acceptability of HIV self-testing suggests levels of trust in self-tests are high, although 11.6% of 8388 survey respondents from an online survey of MSM in Canada indicated low trust in online services was a barrier to access [84, 187]. More specifically, in a review of factors affecting engagement with digital health interventions, trust in information and interaction with the intervention was identified as a barrier to access [186]. In The Netherlands, users of an online service for Chlamydia screening reported distrust in the postal system and did not like the idea of returning samples by post [174].

The level of trust that an individual has in the accuracy of a self-test result influences access to online services for STI testing. In an internet survey of MSM investigating intentions to use online services for STI testing 45.5% of MSM who were not interested in accessing online services indicated that they were concerned that test results might be less accurate [177]. In a systematic review of the acceptability of HIV self-testing that included 11 studies, three studies, one from Kenya, one from Singapore and one from the USA reported concerns about the accuracy of the self-test [187]. Participants in a qualitative study of MSM in the UK perceived HIV self-tests that required blood samples more accurate than saliva samples [185]. Analysis of data from an online survey of 310 UK based participants investigating the factors that influence use of online services for chlamydia testing found that people who had more trust in test accuracy had higher intentions to self-test for chlamydia [150].

3.7.1.1.2.4 Perceptions of test accuracy

Users' perceptions of self-test accuracy are related to two aspects; the test kit itself and their ability to take the sample correctly [170]. In a Netherlands based cross sectional survey which investigated the psychosocial determinants of self-testing for HIV among 134 self-testers and 200 people who did not self-test, self-testers had higher levels of self-efficacy to test compared to those that didn't self-test ($p=<0.001$) [151]. In France, in a survey of internet using MSM 26.5% of those who did not intend to use online services for STI testing at home reported that they felt were afraid they couldn't use the sample kit properly [188]. In focus groups in the USA which investigated the advantages and disadvantages of point of care testing for STIs at home, participants reported being concerned about reading instructions and results as well as not knowing which test they should perform. Participants also reported worries about the negative consequences of performing the test incorrectly [189]. In the USA in interviews with black African MSM and

transgender women, participants reported feeling as though self-efficacy to test was a barrier to home testing and reported a general anxiety around testing and being alone or unsupported during or after testing [181]. One participant commented that they weren't medically qualified to take the sample [181].

3.7.1.1.2.5 Response efficacy

Many online services offer STI self-sampling at home with electronic delivery of results. In these contexts, a user's response efficacy may influence their access to online services. Response efficacy refers to how a user feels about being able to receive the result of an STI test and taking the appropriate actions in response to the result. In two cross-sectional surveys investigating the psychosocial determinants of self-testing, one for chlamydia in the USA and the other for HIV in the Netherlands, in multivariate analysis, response efficacy remained associated with use of self-testing (p=<0.001) [151, 190]. In France in a survey of internet using MSM, of the 816 men that indicated that they were not interested in accessing online services for STI testing, 362 (44.4%) indicated that they did not want to discover the results of the test at home alone [177]. In the USA, in interviews with black African MSM and transgender women, several participants reported concerns about what would happen if a positive test would occur [181].

3.7.1.1.2.6 Other social or belief factors

Other factors that influence an individual's access to STI self-sampling include subjective norms, a user's moral obligation to test and their perceived speed of results. Subjective norms are perceived social pressures to engage or to not engage in a behaviour [143]. In a cross-sectional survey of 518 users and 600 non-users of HIV self-testing in the Netherlands, participants were more likely to self-test for HIV if they considered self-testing to be a normal part of health care (aOR=1.8 95%CI=1.1, 1.3 p=<0.05) [151]. Results from the same study as well as a similar study investigating chlamydia screening online with 277 participants indicate that users of self-tests are more likely to perceive a moral obligation to test [151, 190]. Finally, in interviews with young people in London, participants reported that receiving their results faster via an online service would facilitate access, although they felt that this would be a tradeoff between faster results and perceived accuracy of the test result [170].

3.7.1.2 ENABLING CHARACTERISTICS

3.7.1.2.1 ABILITY TO USE THE SERVICE

Should an individual be willing to use online services for STI testing, many factors can influence whether they are able to access the service. Online services are developed with an assumption that that potential users have private internet access and sufficient health literacy to use an online facility [191]. Evidence from qualitative studies suggests that individuals with poor health literacy and or digital literacy could find it difficult to access online services for STI testing. In a systematic review of 19 qualitative studies of factors affecting uptake of digital health innovations, poor digital literacy was identified as a barrier to access [186]. In interviews with 25 young people in south London which investigated young people's perceptions of smartphone enabled self-testing for online care for STIs, participants stressed the importance of ease of use of the service [170]. While population levels of internet access in Europe may be very high, not all individuals will have access. One study in the Netherlands which investigated reasons why people did not take part in an internet-based screening program for chlamydia found that 2% of those that did not take part did not have access to the internet [174].

Additionally, language could be a barrier to access for those who are unable to read the language that the online service uses on a website or in instruction leaflets. In a qualitative study in the USA investigating barriers to home testing for STIs, participants suggested that having instructions only in English could be a barrier to access [189].

Fear of needles could also be a barrier to accessing online services that require blood samples [185]. In focus groups with 47 MSM in the UK investigating barriers and facilitators to HIV self-testing, participants reported that needle phobia could be a barrier to access for a small number of MSM for whom it affects [185].

If users of online services incur a financial cost for testing online, cost may act as a barrier to access. A systematic review of the acceptability of HIV self-testing which included 11 studies from both resource poor and high income settings found that acceptance of HIV self-testing was influenced by cost, although most users were willing to pay a small to medium amount [187]. However, other studies suggest cost is a barrier to use. In France, in a survey of 816 internet using MSM were not interested in accessing online services for STI testing 68 (8.3%) said they weren't interested because they didn't have enough money to pay for it [177]. In two qualitative studies in the USA, one with black African MSM and transgender women and another with attendees of adolescent health services, participants reported cost as a major barrier to accessing online services for STI self-sampling at home [181, 189].

3.7.1.2.2 PERCEIVED NEED FOR SUPPORT

The absence of a health care provider during the sampling procedure can be barrier or a facilitator of access to STI testing. In a survey of 8388 MSM in Canada investigating internet-based testing for STIs, 17.97% reported the absence of a doctor or nurse as a perceived drawback of online testing, while 9.81% said the absence of a doctor or nurse was a benefit of using online services for testing [84]. In interviews with 25 young people in London, participants described a tension between wanting faceless health care to reduce risk of feeling stigmatised or embarrassed and needing a health care professional present during testing to deal with the anxieties associated with self-sampling and worry about results [170]. In a systematic review of studies of the acceptability of HIV self-testing three studies involving potential service users and service users reported that the absence of post-test counselling was a limitation of HIV self-testing [187]. In the USA, in the study of 217 Californian women who were offered a chance to use an online service for STI testing, women were more likely to complete the test if they had tested for STIs in the past (OR=2.17 95%CI=1.05, 4.51, p=0.037) [180]. This may relate to confidence in performing the sampling procedure or response efficacy, however further investigation is required.

3.7.1.2.3 LIVING CIRCUMSTANCES

Whom a user lives with may influence whether they use online services. Descriptive analysis of data from a survey of RCT participants that investigated acceptability of home-based chlamydia retesting strategy found that comparing those with a preference for home testing to those who didn't, there were significant differences in being comfortable having the kit sent to their home ($p = 0.045$). People living with friends or flat mates rather than with their partner or parents were more likely to be comfortable with having a kit sent to their home [178]. In the USA, in the study of 217 Californian women who were offered a chance to use

an online service for STI testing, a very weak relationship was found between their relationship status and their likelihood of completing the test. Of those who tested online, 42% were not in a stable relationship, 50% were in a relationship while 8% were married. Of the women who did not test, 26% were not in a stable relationship, 61% were in a relationship and 13% were married p=0.062[180]. However, this study investigated relationship status, not living arrangements.

3.7.1.2.4 CONVENIENCE

Increased convenience of testing has been cited as a benefit of online services for STI testing in many qualitative studies investigating the feasibility of online services [170, 172, 176, 185, 186, 189]. In a systematic review of attitudes and acceptability of HIV self-testing, 13 out of 18 studies in high income countries reported convenience as a reason to self-test [176]. Interviews with 25 sexually experienced young people aged between 16 and 24 years old in London revealed that young people perceived online services to make access to STI testing quicker, easier and more convenient [170]. In Manchester, the majority of users of an online service offering home based self-sampling for HIV felt the method of testing was easily accessible, particularly for those who lived in areas where local services were no longer available [184]. In focus groups with prospective users of home rapid testing kits for STIs in the USA, participants noted that home access could avoid the hassle of going to the clinic, making a clinic appointment and avoiding the embarrassment associated with going to a clinic [189]. In a Canadian survey, a larger proportion (23.6%) of those who intended to use an online service for HIV self-sampling reported convenience as the main benefit of the service than those who avoided or delayed testing (18.6%) [84]. However, not everyone finds online services convenient. In focus groups with young men in Scotland investigating young peoples' views of an online chlamydia screening website, young deprived men from semi-rural locations didn't find the online service more convenient than a clinic service.

3.7.1.3 CHARACTERISTICS ASSOCIATED WITH NEED

3.7.1.3.1 PERCEIVED NEED FOR TESTING

Two studies have reported an association between perceived vulnerability to infection and use of online services for STI testing. In multivariate analysis of a cross-sectional UK based online survey investigating the influence of psychological constructs on intention to use STI self-sampling services or to test with a health care provider, higher levels of perceived vulnerability were associated with intention to test with a health care provider [150]. While in the Netherlands, in a survey of 134 self-testers for HIV and 200 non-testers, self-testers had higher levels of perceived susceptibility to infection compared to non-testers [151]. However, this study compared self-testers to non-testers, rather than clinic testers and therefore, rather than suggesting increased levels of susceptibility are associated with self-testing, is more likely to show the influence of increased levels of susceptibility on any testing.

3.7.1.3.2 EVALUATED NEED FOR TESTING

3.7.1.3.2.1 Previous infection

One study reports that previous infection may act as a barrier to accessing online services. In Australia, in a study of user preferences for chlamydia retesting at home or in clinic, having previously been diagnosed with chlamydia was associated with a preference for re-testing in a clinic rather than in an online service (p=0.03) [178].

3.7.1.3.2.2 Sexual behavior risk factors

There is conflicting evidence for how sexual behaviour risk factors are associated with use of online services for STI testing. Evidence from a randomized controlled trial in Australia which included 600 men and women found no association between preference for home testing to re-test for chlamydia at home and the number of sexual partners someone has had in the previous three months [178]. In the USA, in a multivariate analysis of 217 women who were offered access to an online service for STI testing, there was very weak evidence that people with fewer sexual partners in the past 12 months were less likely to complete a test using the online service (OR=0.53, 95%CI=0.26,1.05 p=0.074) [180]. Other risk factors for STI infection may be associated with use of online services for STI testing. In France, MSM who reported unprotected anal intercourse (UAI) with a casual partner in the past 12 months were more likely to have an interest in using online services for STI self-sampling at home compared with those who had no had UAI with a casual partner in the past 12 months (OR=1.84 95%CI=1.37,2.43 p=<0.001) [177]. In the USA, multivariate analysis of a survey of African American and Latino MSM found that men who reported having sex while under the influence of alcohol were more likely to request a HIV test kit online compared to those who did not report sex while under the influence of alcohol (aOR=2.46 95% CI=1.06, 5.77 p=<0.05) [192]. However, none of these studies directly compare users of online service to users of clinic services therefore it is not clear whether these associations reflect an association between the risk factor and use of any service for testing.

3.8 CONTEXT RELATED BARRIERS AND FACILITATORS TO USE

The following section summarises the existing literature relating to the contextual factors that influence access to an online service. The existing literature identified only service characteristics that influence access to online services within the contextual characteristics. This section describes barriers and facilitators to accessing the service that are associated with predisposing and enabling characteristics of services. The search did not identify any literature relating to the service factors relating to need.

PREDISPOSING CHARACTERISTICS

3.8.1.1.1 PROMOTION STRATEGIES

Awareness of online services is key to people accessing them, therefore promotion strategies that raise awareness of online services influence access to them [186]. In a systematic review of 19 qualitative studies investigating the factors affecting uptake of digital health interventions, poor awareness of digital services was identified as a barrier to use [186]. Promotion strategies can also influence who accesses the service and therefore influence the diagnostic rate and public health benefit. The systematic review recommended targeted promotion of digital services to higher-risk groups to increase awareness amongst these groups and therefore improve access [186]. Evidence from a USA based website which offers free of charge testing for bacterial STIs via postal test kits that targeted young men aged >14 years shows how targeted promotion can improve access for higher-risk groups [179]. By targeting higher-risk young men, the service diagnosed at least one STI in 106 (21%) of 501 male users, a diagnosis rate higher than most sexual health clinics (7.5-10.1%) [179].

3.8.1.2 ENABLING CHARACTERISTICS

3.8.1.2.1 ONLINE INTERFACE AND USER JOURNEY

Studies describe how the perceived ease of use of the user journey and the perceived credibility of the service influence use of online services [92, 170, 186]. The perceived ease of the user journey through a service is a common theme cited as an influence of access to digital innovations for health services [186]. Services that are perceived as easy to use facilitate access, and those that are perceived as difficult to use provide barriers to access[186]. A user's perception of how easy a service is to use can depend on the size, location and content of information and support and the type and amount of data input required from the user [92, 170, 186]. The design of the online interface can influence access to online services for STI self-sampling. In nine focus groups with 49 young people in London conducted to help develop the user interface for mobile based sexual health interventions, clear navigation pathways and access to support were highlighted as factors that would facilitate use[92]. Services that require a large amount of information at user registration may be considered to be cumbersome and slow [186]. In addition, evidence from focus groups with young people in London suggests that entering personal information can increase concerns about breaches of confidentiality [92]. However, a before after evaluation of the impact of requiring users to set up an account on an online service for STI self-sampling at home in the USA, found that the changes did not decrease the number of kits requested (before n =1,116 compared to after n=1303) or the proportion of kits returned (before 61.9% compared to after 65.8%). more users requested a kit after the changes were made to the site [193].

The credibility of an online service can influence use of services. In focus groups with young people in London, participants reported making initial judgements about the credibility of the service based on the look and feel of the interface [92]. Participants also linked credibility with their trust in the service [92]. Other studies have suggested credibility is gained through branding with health services [92, 170, 186]. Qualitative studies with young people in the UK suggest that users feel NHS branding to increase the credibility of mobile and online services and therefore increase trust in the service [92, 170]. A lack of clinical endorsement has also been identified as a barrier to digital health innovations [186].

3.8.1.2.2 METHOD OF COMMUNICATION WITH USER

Because privacy is considered to be a high priority among users of STI testing services, how an online service is able to conceal evidence of the test or the test result will influence how accessible it is to users [92, 170]. Both social and institutional privacy are a concern amongst young people when testing, therefore how the service is branded and the method of communication with users can influence use. In qualitative interviews with young people in London the confidentiality and data security provided by a service improved levels of trust amongst participants. While NHS branding on an online service increased the credibility of a service, there was a common assumption that data provided to an NHS service was shared across services [170]. Young people in focus groups in London discussed the potential breaches to social privacy that text messages about test results or partner notification could cause [92]. The logo and name of a service are also important influences to use of online services. Names and logos which explicitly relate to sexual health and STI testing can be a barrier to use because of the potential for a breach of social privacy [92].

3.8.1.2.3 METHOD OF DELIVERY

The method of delivery for sampling kits influences use of online services for STI testing. Online services for STI self-sampling at home may deliver sampling kits to households via a postal or delivery service or they may offer the opportunity for users to pick up kits at a community setting [75]. Users prefer receiving tests in the post and complete and return more tests when they are posted to their address. In an Australian RCT of home versus clinic retesting for chlamydia, of the 236 people who were randomised to the home testing arm, 91.5% said they preferred receiving kits by post compared to collecting them from a community location [178]. In the USA, a survey of users of an online service that offers self-sampling kits for bacterial STIs found 72.5% of users preferred receiving the kits in the post and only 6.3% preferring pharmacy pick up [90]. According to a systematic review that included four studies from the US, Australia and Sweden where postal sampling kits for chlamydia and gonorrhoea were available through online and telephone services, return rates were higher in the three studies that posted sample kits (31.1%-62.5%) compared to community pick (20%) [75]. Additionally, qualitative interviews with users in the USA suggest the method of returning samples to the laboratory can also influence whether someone uses an online service. Focus groups with sexually active young women in the USA identified stamped addressed return envelopes for STI samples as a facilitator to accessing testing [194].

3.8.1.2.4 THE SAMPLING PROCEDURE

The technique required to collect samples at home could influence access to online services for STI testing [90, 195]. Collection of samples for chlamydia and gonorrhoea require different techniques to those of HIV and syphilis. Self-collected samples for chlamydia and gonorrhoea can be collected via urine and/or self-administered, vaginal, rectal and/or pharyngeal swabs, depending on the type of sexual activity a person has. Feasibility and acceptability studies have suggested this type of sampling is highly acceptable [90, 195, 196]. In a survey of 400 female users of an online service for STI self-sampling at home in the USA 54.3% of women preferred self-administered vaginal swabs, 8.8% preferred urine, 12.8% were happy with urine or swabs and the remainder preferred having a pelvic exam or did not know or respond [90]. In a clinic based study in The Netherlands which included 2394 men and women who had had receptive anal sex in the past six months, high levels of acceptability were reported with 97% of men and 95% of women saying they were happy to use self-administered rectal swabs again [195]. Pharyngeal swabs are also highly acceptable and considered easy to use amongst men who have sex with men [196].

The type of sample required to test for HIV is either a blood or saliva sample. If a user is required to sample for both HIV and syphilis, usually one blood sample can be used for both tests. In a systematic review of 11 studies that investigated the acceptability of HIV home testing, HIV tests that required saliva samples were considered to be easy to perform compared to those that required blood samples [187]. In a systematic review of 12 studies of HIV self-testing at home, seven of the 12 studies reported on preferences between salivary samples and blood samples, of which four reported a preference for saliva samples and 3 reported a preference for blood samples [176]. In a UK based study of home sampling for HIV comparing blood and saliva sampling, people were more likely to choose kits that required blood samples over saliva samples (n=9532, 66.6% compared to n=4780, 33.4%), although there was weak evidence that saliva samples were more likely to be returned with 49.9% of requested blood samples returned compared to

52.2% of requested saliva samples (p = 0.01) [197, 198]. In a national online survey of HIV negative or status unknown MSM in the USA, 58% of men rated themselves extremely likely to test at home for HIV using saliva samples while only 23% of men rated themselves extremely likely to test at home using a sample that required blood and 29% of men rated themselves extremely unlikely to test at home using a test that required a blood sample [199]. Therefore, because blood sampling kits require users to prick their skin to draw blood, online services that offer only blood sampling kits could reduce access for those with fear of needles.

DISCUSSION

3.9 Main findings

Thirty-seven studies reporting factors that influence the use of online STI services, STI self-testing services or STI self-sampling services were identified. These studies report a broad range of factors that influence access (potential and realized access) to online services for self-sampling at home that relate to the individual and to the context/service being delivered. While this review identifies evidence that these factors influence access to online services for STI self-sampling at home, in most cases it is not clear whether these factors act as barriers or facilitators to access.

For demographic factors, including those that relate to the higher-risk groups for STI infection in England (gender, ethnicity, sexual orientation and age) it is not clear whether online services will improve access among these groups. While some studies present evidence that online services will improve access among these groups, others present evidence that online services could be a barrier to access. Among individual social and belief factors (education, privacy, trust, perceptions of test accuracy, response efficacy, subjective norms, moral obligation and perceived speed of results) there was also mixed evidence about the association between education and use of online services. Privacy was reported to be a benefit of self-sampling in many studies, but other studies identified concerns about social privacy and institutional privacy concerning data security. Higher levels of trust in the service, test accuracy, more normative beliefs, a moral obligation to testing and perceived speed of results to be fast were associated with access to online services.

Among the enabling factors relating to the individual, evidence for the influence of ability to use the service and living circumstances is relatively consistent. Digital literacy may be a barrier to access of online services, however this evidence is generated from qualitative studies while there were no studies measuring the effect of digital literacy on actual use of services. Those living in circumstances where they find it easier to conceal or do not need to conceal testing find it easier to access online services. There was less consistency in the evidence for how perceived need for support and convenience influence access to online services. A lack of support from a health care provider was reported as a facilitator to access because social privacy was improved, but a barrier to access because health care providers helped people test. If and how an online service was convenient varied between studies.

Among the factors associated with need for testing, there was relatively consistent evidence that those with higher perceived need accessed face-to-face services over online services. Evidence for the influence of behavioural risk factors for STIs on accessing online services was mixed. However, none of the studies of sexual risk behaviours directly compared users of online service to users of clinic services therefore it is not clear whether these associations reflect an association between the risk factor and use of any service for testing.

Evidence relating to the characteristics of the context is presented for promotion strategies, the online interface, methods of communication and sampling procedure. Viewing these factors through the lens of the Andersen model, promotion strategies predispose use, while the online interface, methods of communication and sampling procedure enable use. There is relative consistency on how the specific

aspects of the design of the online service will influence who accesses the service. How the service is promoted, and to whom, what the online interface and user journey consist of, the method of communication between the service and the user and the sampling procedure, will influence access. Promotion strategies that target specific groups have proven to be successful [179, 186]. An online interface that users perceive to be easy to use and credible can be a facilitator to access. A service that communicates with users in a way that the user can maintain social privacy can improve access. Finally, a sampling procedure that is perceived as easy, where users can access support and one that does not require needles can facilitate access. However, access to service requires an interaction between the user and the service, therefore the service design should be considered in the context of the users for whom it is providing access [167].

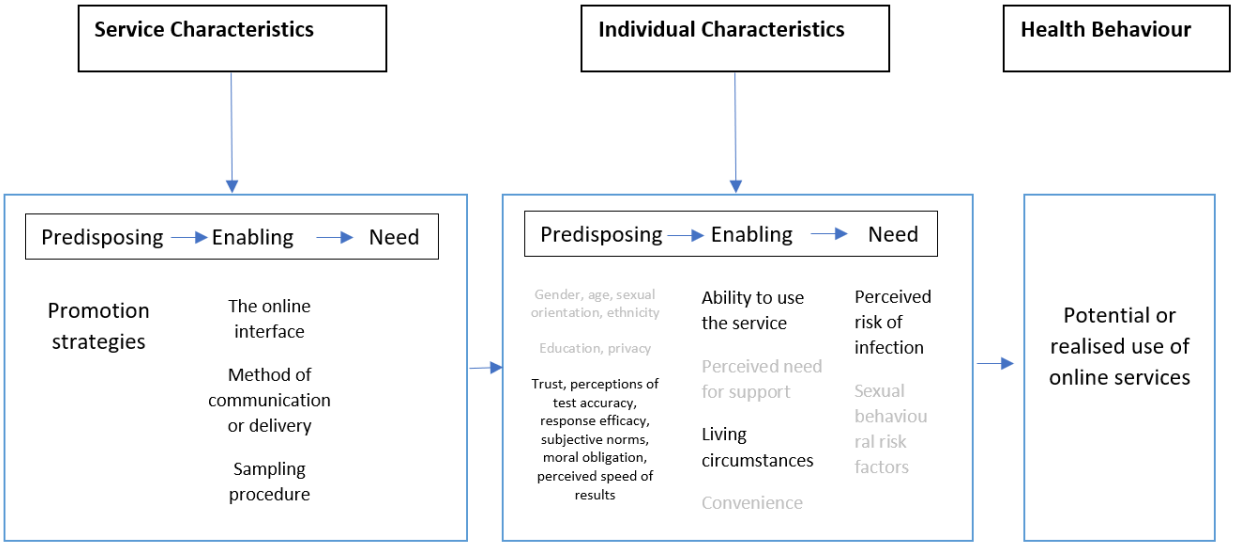
3.10 Differences between findings from studies of existing services from those of hypothetical services

The findings presented in this review include 18 studies that investigate the factors that influence access to a hypothetical service, 18 studies that investigate factors that influence access to an existing service and one review that includes evidence from both hypothetical and existing services (Table 3.1). All the studies that investigated existing services were quantitative, while of the 18 studies investigating hypothetical services nine were qualitative and nine were quantitative. Among studies of existing services, the study populations include both actual users as well as potential users. The heterogeneity between study design, study populations and service types prevent a meaningful direct comparison of the evidence from studies of hypothetical services and studies of existing services is possible. However, broadly – qualitative studies of hypothetical services have investigated factors influencing access that go beyond directly observable demographic factors [92, 149, 200]. Among the quantitative studies investigating access to an existing service, many of these are limited to presenting demographic and social characteristics of users [179, 201]. One study of self-testing in The Netherlands investigates psychosocial factors influencing access among actual service users [151]. The lack of qualitative investigation of the factors influencing use of online services for STI self-sampling at home among actual users of an existing service may result in a body of evidence that does not cover the breadth of factors influencing use.

3.11 Placing the findings within the Andersen Model for Access to Medical Care

Figure 3.1 places the findings of the review within the Andersen Model for Access to Medical Care [97]. Factors in grey text represent factors for which evidence of the effect of the factor on access to online services is mixed. The review identified factors within three of the major four components within the Andersen Model. It identified how service characteristics (contextual) interact with individual characteristics to influence both potential and realised access to online services (health behavior). In line with Andersen's model, the findings of the review describe a relationship between the context (service) and the individual characteristics and service use. It did not identify any factors associated with the outcomes of service use. There was no evidence identified in this review for the relationships between factors or any feedback between the different components of access. However, because the field of evidence for access to online services is relatively new and continually developing, this is likely to reflect the absence of evidence, rather than evidence of absence.

Figure 3.1 Placing the Review Findings within Andersen's Model for Access to Medical Care



Grey text indicates evidence of the effect of the factor on access to online services is mixed

3.12 Strengths and limitations

This review is the first of its kind to identify the barriers and facilitators to use of online services for self-sampling at home. The review presents evidence from studies that relate to STI services that vary in terms of their characteristics (Table 3-1). Evidence is also drawn from a wide range of populations. Even among studies that have been conducted in the same country, some studies focus on specific higher-risk groups, while others report access generally across the population. Much of the existing evidence refers to potential service users, while a small number of studies refer to actual use of services therefore how access is defined differs between studies. The wide scope of the review is a strength and a limitation. It is a strength because it enables the identification of the factors that influence service use within a relatively small field of evidence. However, it is a weakness because the heterogeneity between study types and services means the review is unable to identify how these factors will influence access. In addition, the wide scope of the review results in the inclusion of study designs inherent with considerable bias. However, narrowing the scope of the review based on study quality would result in the identification of fewer factors that influence service use. A formal assessment of bias has not been conducted as part of this scoping review because the purpose of the review was to summarise the existing literature and to identify the factors that influence access, rather than to quantify or summarise the effect of these factors [162].

3.13 Gaps in the evidence relating to the wider research question

The review includes evidence for the factors that influence access among higher-risk groups including MSM (six studies) and young people (five studies). However only two studies focusing on ethnic minority groups are included, and both are based in the USA. Most of the cross-sectional studies identified are descriptive of service users and offer no comparison group. No comparative cross-sectional studies compare the characteristics of clinic users to those of online users. Therefore, the review is unable to address the question of who these services might serve. The evidence presented in this review identifies

the characteristics of services and contexts at an individual level, rather than an area level. As a result, there is a dearth of evidence relating to how some of the wider contextual factors, such as population structure and need for services or health policy influences use of online services. Additionally, because much of the evidence presented relates to prospective services or intention to use services, there is a lack of evidence for how use of online services influences future use of testing services (health behaviours) and customer satisfaction (outcomes).

3.14 Rationale for further research

This review identified the factors that influence access to STI self-sampling at home. The review did not identify how these factors influence access between individuals or how this may vary by context. No evidence was identified that compares the characteristics of those that access online services to those that access clinic services. To understand access to online services within the context of the wider service mix, further research is required. Therefore, evaluating the impact that an innovation has on service access will require an investigation in to how the characteristics of that service interact with the characteristics of the population that it serves.

This PhD examines access to SH:24, an online service for STI self-sampling at home, within the context of the London Boroughs of Lambeth and Southwark. It investigates both potential and realised access to online services. It aims to identify the barriers and facilitators to access and describe the effect to which these influence access. The following chapter describes the methods it will use to do this.

Chapter 4 OVERVIEW OF METHODOLOGY

INTRODUCTION

Chapters 1 and 2 set the scene for the evaluation of access to online services for STI self-sampling at home and defined and conceptualised equity of access to services. Chapter 3 described the existing literature for the factors that influence access to online services for STI self-sampling at home and describes the rationale for the research carried out in this thesis. This chapter provides an overview of the methods and data sources used in this thesis. It describes the style of the thesis, the research objective, study designs and ethical approval obtained. It also gives a detailed description of the study setting and the online service SH:24.

THESIS STYLE

There are two main styles of thesis: the 'book' style and the 'by publication' style. The more traditional 'book' style thesis typically consists of a monograph in book form with separate chapters for the introduction, literature review, conceptual development, analyses, and conclusions. The 'by publication' style thesis presents three or more publications authored or co-authored by the PhD student. In this style, each of the publications is be structured with its own introduction, methods, results, discussion and conclusion and the overall thesis will also have a wider introduction and discussion. In practice these styles are not entirely distinct and stylistically many theses sit somewhere between the two.

The style of this thesis sits between the 'book' style and the 'by publication' style. The different analyses within the thesis are written up into extended publication-style reports, whereby although their structure is like that of a research paper, the extended length allows for a depth of detail which cannot be achieved when abiding by scientific journals' maximum word counts. By presenting the thesis in this style, the specific details of the methodology employed in each chapter can be interpreted in relation to the specific aims, objectives and results of the chapter. This is especially helpful when presenting a mixed-methods thesis. However, inherent in this style of thesis is some repetition in the 'introduction' sections of certain chapters.

RESEARCH OBJECTIVES

The overarching objective of this thesis is to explore equity of access to online services for STI self-sampling at home in Lambeth and Southwark. To achieve this objective, several sub-objectives are addressed within five results chapters. The overarching objective of each results chapter is presented in Table 4-1. Further sub-objectives of the chapter objective are defined within each chapter. How the evidence presented in each results chapter contributes to the overarching research objective is discussed in the thesis discussion (Chapter 10).

Table 4-1: Objectives for Each Results Chapter in the Thesis

Results chapter	Objective
Chapter 5	To compare the characteristics of those completing a STI test using an online service for STI self-sampling at home to those using clinic services.
Chapter 6	To explore the barriers and facilitators to use of online services for self-sampling at home among users of the service
Chapter 7	To develop an initial composite measurement scale (CMS) for the barriers and facilitators to use of online services for STI self-sampling at home
Chapter 8	To refine the CMS and establish the psychometric properties of the CMS.
Chapter 9	To use the CMS to identify the factors that are associated with use of online services compared to face-to-face services

POTENTIAL CONFLICTS OF INTEREST

The PhD was funded by a grant from Guy's and St Thomas' Charity (GSTC) Innovation fund. In September 2013, SH:24, the online service which operates as a not for profit community interest company received a grant from GSTC for Modernising Sexual Health Care with SH:24. Part of this grant was used to evaluate the service. This PhD, along with two others was funded to evaluate the online service. Paula Baraitser, a director of SH:24 supervised the three PhD students funded through the grant.

The potential for conflict of interest of a director of the service to supervise research carried out on the service was recognised early in the process of the PhD. The following steps were taken to manage the conflict effectively so that the integrity of the project was not compromised.

- Independence from the online service was maintained by physically remaining based within an academic institution, rather than at the online service
- Of my three supervisors, two maintained independence of the service and in separate academic institutions (LSHTM and IOP)
- All major decisions were discussed with all three supervisors
- All potential conflicts of interest were declared when communicating the results of the analyses
- A record of communications with supervisors was maintained

STUDY DESIGN

This thesis employs a mixed methods approach to evaluating access to online services for STI self-sampling at home. A mixed methods approach is one that includes at least one quantitative study and one qualitative study where neither type of method is inherently linked to one enquiry paradigm or philosophy [202]. In this thesis, qualitative and quantitative methods are used to explore differences in access to online services. The use of mixed methods in this thesis is driven by pragmatism and motivated by the fact that neither a single quantitative method or qualitative method alone can address the complexity of the

evaluation of access to online services for STI testing [203]. This pragmatic approach to evaluation is increasingly common in health services research in the UK [203].

The type of methodologies that are employed in this thesis are done so in a way that is developmental [202]. They are used developmentally by employing the methods sequentially. The results of the quantitative analysis of data in Chapter 5 provide a rationale for the qualitative exploration of barriers and facilitators to access in Chapter 6. The results from this qualitative study inform the development of a survey in Chapter 7. This survey is evaluated and refined using quantitative methods in Chapter 8. Finally, the results of this survey are analysed in Chapter 9 to determine the barriers and facilitators to use of online services for STI self-sampling at home.

Different analytical techniques are employed throughout the thesis. The type of analytical technique employed is determined by the type of data and the objective of the analysis. Both existing sources of data and data collected primarily for the purpose of achieving the research objectives are utilised. This approach is pragmatic, existing datasets are utilised where they are available and contain appropriate data for the research objective. The collection of primary data is carried out where existing data is not available, or those that are available do not contain appropriate data for achieving the research objective. The data sources used in each chapter are described in detail within the results chapters. In Chapters 8 and 9, where the same data source is used for different analysis, there is some repetition regarding the data sources. Table 4-2 describes the methodology, data sources and type of analysis for each of the five results chapters in this thesis. A detailed description of the methodologies employed in each study is provided within each results chapter.

Table 4-2: Methodology, Data Sources and Type of Analysis Employed in Results Chapters

Results chapter	Methodology	Data source(s)	Type of Analysis
Chapter 5	Quantitative	Genito-urinary Medicine Clinical Activity Data (GUMCAD)*	Cross-sectional analysis
Chapter 6	Qualitative	Qualitative interview data ^	Descriptive qualitative analysis
Chapter 7	Theoretical	Qualitative interview data ^	Development of survey items using themes generated from qualitative interviews in chapter 6
Chapter 8	Quantitative	Pilot survey data ^ Online survey data (e-survey) ^	Analysis one is a psychometric evaluation and item refinement using pilot data. Analysis two is a psychometric evaluation of e-survey data
Chapter 9	Quantitative	Gettested Trial baseline data* Online survey (e-survey) data ^	Analysis one links Gettested Trial data and e-survey data for a cross-sectional analysis

		Telephone survey (tele-survey) data ^	Analysis two links all three data sources for a longitudinal analysis

* Existing dataset ^ Data collected specifically for use in this thesis

THEORETICAL APPROACH

Epistemology is the branch of philosophy that is concerned with the theory of knowledge, how we know things, the nature of knowledge and its limitations. The epistemological stance taken within a piece of research guides not only in the manner in which research is performed, but also in how the investigator defines truth and reality and how the investigator comes to know truth or reality [204, 205]. It is therefore important to define the overarching epistemological stance of the research presented this these.

This thesis adopts a pragmatic epistemological approach because the aim of the thesis is to achieve results that are meaningful and applicable to the study population [204, 206, 207]. This stance is common in mixed methods study designs, as it supports the simultaneous use of qualitative and quantitative methods of inquiry [207]. Taking a pragmatic approach within the thesis offers an epistemological justification and logic for a mixed methods approach. It also allows the flexibility to use different research paradigms within different methodological approaches because it allows research paradigms to remain separate within their individual methods, then to come together to achieve the overarching goal [208].

STUDY SETTING

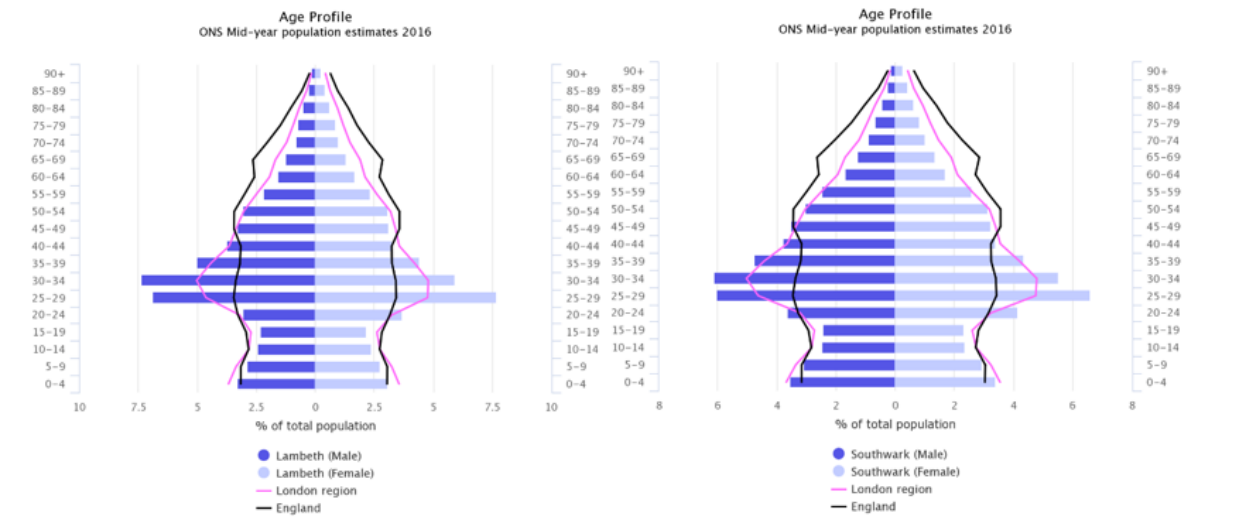
This thesis evaluates access to the online service SH:24 in the neighbouring London Boroughs of Lambeth and Southwark. These two Boroughs are geographically located south of the River Thames and form part of region of Inner London. The location of the Boroughs within Greater London is illustrated in Figure 4.1. Lambeth is the largest inner London Borough and Southwark is the third largest. Together they have a total geographical area of 55.67 square kilometres [209, 210], stretching the southern border of the river Thames in the north to Dulwich and Streatham in the south. Lambeth lies to the west of Southwark, with their join border running north to south. Breadth of the two Boroughs extends from Clapham in the west to Camberwell in the east.

Figure 4.1 The location of Lambeth and Southwark within Greater London [211]

The total population of the two Boroughs was 633,332 in 2015, with 324,431 (51%) of these residing in Lambeth and 308,901 (49%) residing in Southwark [212]. Lambeth and Southwark are both densely populated. Lambeth has an average of 12,000 residents per square kilometre and Southwark has an average of 11,000 residents per square kilometre [213]. This compares to an average of 5,600 for London, and just 366 per square kilometre for England as a whole [213]. Both Boroughs are expanding due to high birth rates and inflow of immigrants combined with low death rates [209, 210]. Like most London Boroughs the total population change (the proportion of people moving in and out of the Borough) is high with 12% of the population leaving the Boroughs each year [209, 210].

In both Lambeth and Southwark, the resident population is split relatively evenly between males and females. The two boroughs have relatively young age profiles compared to other London boroughs. Lambeth's population consists mainly of young working age people, rather than families. Over half of the population is aged between 20 and 44 years. Importantly for sexual health, almost a third of the population is aged between 25 and 34 years. Southwark has a slightly higher proportion of young people aged 0 to 20, compared to Lambeth. However, like Lambeth, Southwark has a higher proportion of young working age people compared to London and the UK. The 2016 mid-year population estimates by age and gender for Lambeth and Southwark are presented in Figure 4.2.

Figure 4.2: Age and Gender profiles of Lambeth and Southwark [214]



Both Boroughs are ethnically diverse with a complex ethnic and social mix. Both Boroughs have a higher proportion of black and ethnic minority groups compared to London. Around 40% of the population in Lambeth are white British or white Irish, and 15% are from other white backgrounds. Lambeth's largest non-white ethnic group is black African (11.5%), followed by black Caribbean (9.8%) [209]. The Asian population (7.8%) is relatively small compared to other London Boroughs. There are over 150 languages spoken in the Borough, with 6% of people having a main language other than English [209]. Southwark's white British and white Irish population also accounts for approximately 40% of the total population, and the white other population accounts for 15% of the population[215]. In Southwark the black African population account for 15% while the black Caribbean population accounts for only 6% of the population [215]. The Asian population is slightly larger in Southwark (11%), compared to Lambeth, although it is still smaller than the average in London [215] .

In terms of deprivation, both Lambeth and Southwark are Boroughs of contrast. While the Boroughs are not among the 10% most deprived in London, or England, pockets of deprivation exist within them [209, 210, 215]. Southwark is the 41th most deprived local authority in England, although it contains eight neighbourhoods that are classified as being in the bottom 10% most deprived in the country[215]. Lambeth is the 22nd most deprived Local Authority in England and contains 13 areas that are in the most deprived in England[209]. Additionally, Brixton, the town centre of Lambeth is the most deprived town centre in the country [209].

Estimating the size of the gay and lesbian population in the Boroughs is difficult because national data is lacking. Estimates indicate that Lambeth and Southwark have the largest gay and lesbian population in England [215]. The gay and lesbian population accounts for 6% of the total population in the Boroughs [215]. Data from Lambeth provides an estimate that men who have sex with men (MSM) account for up to 15% of the male population [209]. Additionally, Lambeth is home to many of London's LGBT friendly bars and nightclubs.

In 2016, rates of STIs in these Boroughs were some of the highest in the country [23]. New diagnoses of STIs (excluding chlamydia in under 25s) in Lambeth (3288/100,000) and Southwark (2799/100,000) were more than three times the national rate (795/100,000) and higher than the London regional rate (1547/100,000) [23]. Similarly, chlamydia detection rates (in people aged 16-25 years) in Lambeth (4938/100,000) and Southwark (4041/100,000) were twice as high as national (1882/100,000) and regional rates (2309/100,000) [23].

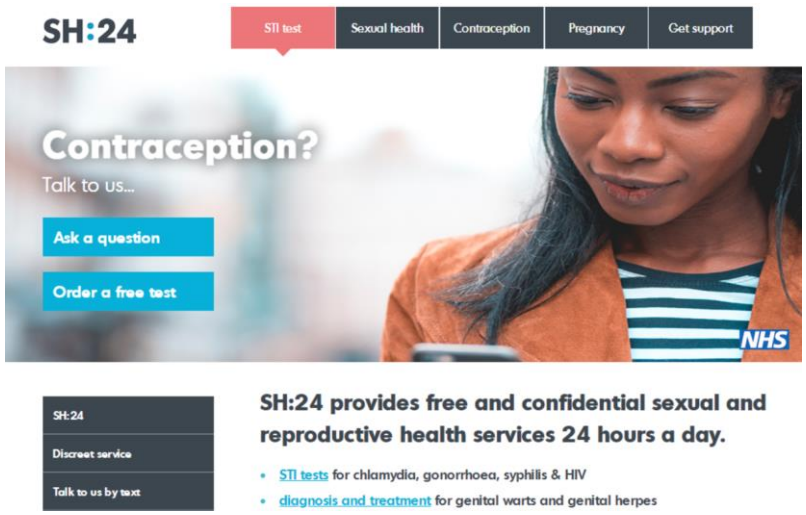
Lambeth and Southwark share a sexual health strategy, along with the neighbouring Borough of Lewisham. In 2016, seven sexual health centres that were open access and free at the point of use served the population in Lambeth and Southwark. In addition, free STI testing was available to young people aged under 25 years with Brook services and the NCSP. A small number of GPs also offered STI testing, although the data for this is unreliable [216]. However, following successive funding cuts in 2015 and 2016, three sexual health centres were closed [217].

Demand for sexual health services in the Boroughs is high. Between 2015 and 2016 there were almost 90,000 walk-in attendances at sexual health services and almost 100,000 appointments at services [217]. Of the 179,000 procedures that took place at sexual health services between 2015 and 2016, 81% involved sexual health screening [217]. Of those accessing sexual health services there are more females than males and a varied and diverse ethnic mix of users. The majority (74%) of users are aged over 25 years. Because of the open access policy of sexual health services, users from any Borough can attend the sexual health services. In 2015 25% of users were from Lambeth, 29% from Southwark and the remaining 46% were from outside of the two Boroughs [217].

THE ONLINE SERVICE

This thesis examines access to SH:24, an online service for STI self-sampling at home. SH:24 became available to residents of Lambeth and Southwark who are over the age of 16 years in March 2015. The online service offers STI self-sampling kits for chlamydia, gonorrhoea, syphilis and HIV, free of charge to residents via the SH:24 website (www.sh24.org). The landing page for the website is presented in Figure 4.3.

Figure 4.3: SH:24 Landing Page [86]



Initially SH:24 was promoted using cards which were handed out by service staff to members of the public and through posters in clinic services. The service was also promoted via large window graphics displayed on sexual health clinic windows Figure 4.4. During 2015 and for the first three quarters of 2016 no active signposting from clinics to the online service took place. From September 2016, in one large sexual health clinic, a triage process redirected asymptomatic users requesting STI testing alone to order their tests via the online service.

Figure 4.4: Window display advertising SH:24 at Burrell St Sexual Health Clinic

Photo credit: SH:24

Use of the online service involves an interaction with the SH:24 website to order a test kit. Once on the landing page (Figure 4.3), the user can access information about STIs, STI testing, contraception, pregnancy, access support or order a test. To order a self-sampling kit the user must enter personal information about age, postcode, gender and sexual orientation. The user journey is presented in Figure 4.5.

Figure 4.5: SH:24 User Journey[86]

The self-sampling kit is sent to users by post in a plain white opaque envelope with no identifiable markings on the sample containers in the kit. Information about the way the kit is sent is presented to users on the landing page Figure 4.6. The self-sampling kit includes urine sample collection pots, vaginal, rectal and oral swabs, a lancet for finger prick blood collection and a prepaid, preaddressed envelope for return of samples. It also includes pictorial leaflets with guidance on how to collect the specimens. Examples of these are available in Appendix G. Finger prick blood collection involves collecting 15 drops of blood in a vial. The type of testing kit that the online service user receives is tailored to gender and sexual orientation. SH:24 provides support for users remotely via telephone and text message. All users receive a text message with a link to a YouTube video (https://www.youtube.com/watch?v=8gM1DT5PZi8) demonstrating blood sample collection. After a user completes the sampling process, they post return samples to the laboratory in the prepaid envelope provided.

Figure 4.6: SH:24 information provided to users on the test kit delivery

Test results for chlamydia and gonorrhoea are sent to users via text message and users are referred to clinics for treatment and partner notification (PN) if necessary. Users reactive for HIV or syphilis are telephoned and referred to clinic services for confirmatory testing, treatment and PN otherwise those users testing negative are informed by text. At the time of the study the clinical pathway for treatment and (PN) in the online service did not differ from clinic services. The website can be accessed from https://sh24.org.uk/.

THE GETTESTED TRIAL

The Gettested Trial forms an integral part of this thesis for two reasons. First, it is a source of data used within the thesis. Baseline data from the intervention arm of the Gettested Trial is linked to survey data for cross-sectional and longitudinal analyses in Chapter 9. Secondly, the data that is collected in Chapters 6 and 8 and 9 samples participants from the Gettested Trial who were willing to take part in future research (n=1482, 69%).

Recruitment from this population was efficient and appropriate. The availability of trial baseline data made purposive sampling for qualitative interviews relatively fast compared to recruiting from a new population. This was particularly true in the early stages of service delivery, when the number of users of the online service was small relative to later stages. This population was appropriate because it enabled access to participants who were offered use of the service but chose not to use the service and those that tried and failed and therefore the opportunity to explore barriers to access among this hard to reach group.

For studies in Chapters 8 and 9, one group of participants was recruited. Their data was analysed using different techniques to evaluate the psychometric properties of the survey in Chapter 8 and among a sub-group to identify the factors associated with use of online services in Chapter 9. The size of the sample required for the analyses in Chapters 8 and 9 meant that efficiency in recruitment was particularly important. Community based recruitment is time and resource intensive. The Gettested Trial recruited from the community. It took nine months and was heavily resource intensive. Therefore, accessing this group provided considerable savings of time and resources. Trial participants also offered a unique opportunity to observe access to online services among a group of people who received equitable information about the online service, irrespective of their socio-demographic characteristics.

ROLE IN THE GETTESTED TRIAL

My role in the Gettested trial involved recruitment, advising on data management and analysis and well as writing, reviewing and editing the final paper for publication.

4.1 DESCRIPTION OF THE GETTESTED TRIAL METHODS

The following section briefly describes the Gettested Trial aims, methods and study population in the intervention arm. Further information about the trial can be found in the publication of the trial available in Appendix C.

The Gettested Trial is a single blind RCT which aimed to assess the effects of SH:24 on uptake of STI testing and STI cases diagnosed and treated, when delivered alongside usual care [218]. The co-primary outcomes were self-reported diagnosis of an STI at 6 weeks, confirmed by patient health records, and self-reported completion of an STI test at 6 weeks, confirmed by patient health records [218]. Completion of an STI test was defined as samples processed by the laboratory and results delivered to SH:24 or to clinic. Secondary outcomes were the proportion of participants prescribed treatment for an STI, time from randomisation to completion of an STI test, and time from randomisation to treatment of an STI [218].

The trial was carried out between 24 November 2014 and 31 August 2015 in the London Boroughs of Lambeth and Southwark [218]. It recruited 2,072 individuals from the community through universities, colleges and social media [218]. Individuals were invited to take part if they met the following inclusion criteria:

- Resident of Lambeth or Southwark
- Aged 16- 30 years
- Had at least one sexual partner in the past 12 months
- Was willing to take an STI test [218]

If an individual met the inclusion criteria and provided consent to take part in the trial, they were randomised to the intervention or to the control arm. Those in the intervention arm received a text message to encourage them to use the SH:24 online for STI testing at home and those in the control arm received a text message that encouraged them to use GUM face-to-face services for STI testing [218]. The wording of the control and intervention messages is provided below:

Control text message:

You have been invited to use a clinic-based sexual health service.
Please visit https://text4health.lshtm.ac.uk/trials/UI/public_htm/info/clinic.aspx to obtain your free STI test at a walk-in sexual health clinic.
If you have problems accessing this link, please text 'HELP'[218]

Intervention text message:

You have been invited to use an internet-based sexual health service.
Please visit https://sh24.org.uk/betatester to order your free STI test online.
Please do not share this link with anyone.
If you have problems accessing this link, please text 'HELP'[218]

Of the 2072 participants that took part in the trial, eight were excluded [218]. The final analysis included 1031 participants that were randomised to the intervention group and 1032 participants that were randomised to the control group [218]. The randomisation system utilised a minimisation algorithm balancing for gender, age, number of sexual partners in last 12 months and sexual orientation. Therefore, intervention and control groups were similar in respect to these characteristics [218]. The trial recruited more females (58.8%) than males (41.2%) [218]. The mean age of participants was 23 years and the majority of participants were from a white British or white other background (74.1%) [218]. Men who have sex with men accounted for 12.7% of the trial population and 70.6% of participants had two or more sexual partners in the past 12 months [218]. Over a quarter of participants (25.6%) had never tested before. Only 2.9% of participants had tested online before [218]. Further information about the study participants and trial results is available in Appendix C.

In Chapters 6, 8, and 9, where study populations are sampled from the trial population, further details are provided about the process of sampling and the characteristics of the population from whom they were

sampled. A discussion of the limitations and potential bias introduced through the recruitment of the trial population is provided in chapters 6, 8 and 9, as well as the thesis discussion in Chapter 10.

ETHICAL APPROVAL

The research carried out in Chapters 5, 6, 8 and 9 of this thesis required ethical approval from an NHS research ethics committee (REC). RECs are groups of up to 15 people whose aim is to safeguard the rights, safety, dignity and well-being of research participants. In this thesis, the study carried out in Chapter 5 required ethical approval because it analysed clinical activity data for individuals. The studies carried out in Chapters 6, 8 and 9 required ethical approval because they involved surveys and qualitative interviews with participants.

Ethical approval for the study carried out in Chapter 5 was obtained from the NRES Committee North of Scotland - Grampian Ref 15/NS/0031 (Appendix D).

Ethical approval for the study carried out in Chapters 6 was obtained from NRES Camberwell as substantial amendment 6 to the previously approved RCT 14/LO/1477 (Appendix E).

Ethical approval for the studies carried out in chapters 8 and 9 obtained from NRES Camberwell as substantial amendment 8 to the previously approved RCT 14/LO/1477 (Appendix F). Participants were provided with verbal patient information for the pilot study in Chapter 8. Consent for the pilot study was not required because no personal information was taken from participants and the pilot was carried out within the waiting room of an NHS setting. This was approved by two independent bodies (GSTT and KCH) as well as the REC.

CHAPTER 5 COMPARING THE CHARACTERISTICS OF USERS OF AN ONLINE SERVICE FOR STI SELF-SAMPLING TO CLINIC SERVICE USERS: A CROSS-SECTIONAL ANALYSIS.

INTRODUCTION

The literature review in Chapter 3 identified the factors that influence access to online services for self-sampling at home. However, because of the heterogeneity between studies in terms of the type of services and population they served it was not possible to determine how these factors influence access. Therefore, to understand whether the online service SH:24 improves access to STI testing and for whom it does, further investigation is required. This chapter takes the first step towards understanding access to SH:24 by presenting an exploratory, cross-sectional study of users of online and clinic services in the London Boroughs of Lambeth and Southwark.

This chapter investigates predisposing characteristics associated with the individual that influence realised access. Routinely collected service use data are analysed to compare the characteristics of those completing a STI test using an online service for STI self-sampling at home to those using clinic services in the London Boroughs of Lambeth and Southwark. It also compares the characteristics of those who ordered a test from online services and returned it to those who ordered a test and did not return a sample to identify potential barriers to online service use.

By carrying out both analyses this chapter evaluates access in terms of the process of access and the outcome of access. Equity of access to services is referred to in relation to need. Normative need (need defined by experts) is assessed by viewing access between demographic risk groups and describing positive diagnoses in clinics and online services. The findings of this chapter inform the direction of the investigation into equity of access to online services within this thesis.

The findings of this chapter were published in the journal Sexually Transmitted Diseases in 2017. The publication is available in Appendix H.

AIMS

To describe the characteristics of users of online services for STI self-sampling at home and compare them to clinic users.

To describe the characteristics of users of online services for STI self-sampling at home that return a sample for testing and compare them to users of online services for STI self-sampling at home that do not return a sample for testing.

METHODS

The study protocol and STROBE checklist [219] is available in Appendix I and J respectively.

5.1 STUDY SETTING

This study is set in the London Boroughs of Lambeth and Southwark. These Boroughs are densely populated and ethnically diverse with high levels of deprivation [209, 220]. In 2016, rates of STIs were some of the highest in the country [221]. Thirteen sexual health services that were open access and free at the point of use served these areas. In addition, free STI testing was available as part of the NCSP to people aged 15 to 25 years in GPs, although only 5.9% of chlamydia testing for the NCSP was carried out in GP services [216]. More detailed information about the study setting can be found in Chapter 4.

The free online service SH:24 became available to residents of the Boroughs in March 2015 via the SH:24 website (www.sh24.org). More detailed information about the online service is available in Chapter 4.

5.2 STUDY POPULATION

Sexual health service activity data from January 1, 2016 to March 31, 2016 were obtained via electronic transfer from sexual health clinics in the boroughs and combined with service activity data from the online service SH:24 (Figure 5.1). These data are routinely generated by clinics in the form of the Genitourinary Medicine Clinical Activity dataset (GUMCAD) for monitoring by Public Health England (PHE). Data provided were produced in accordance with GUMCADv2 Technical Guidance [222].

5.3 INCLUSION AND EXCLUSION CRITERIA

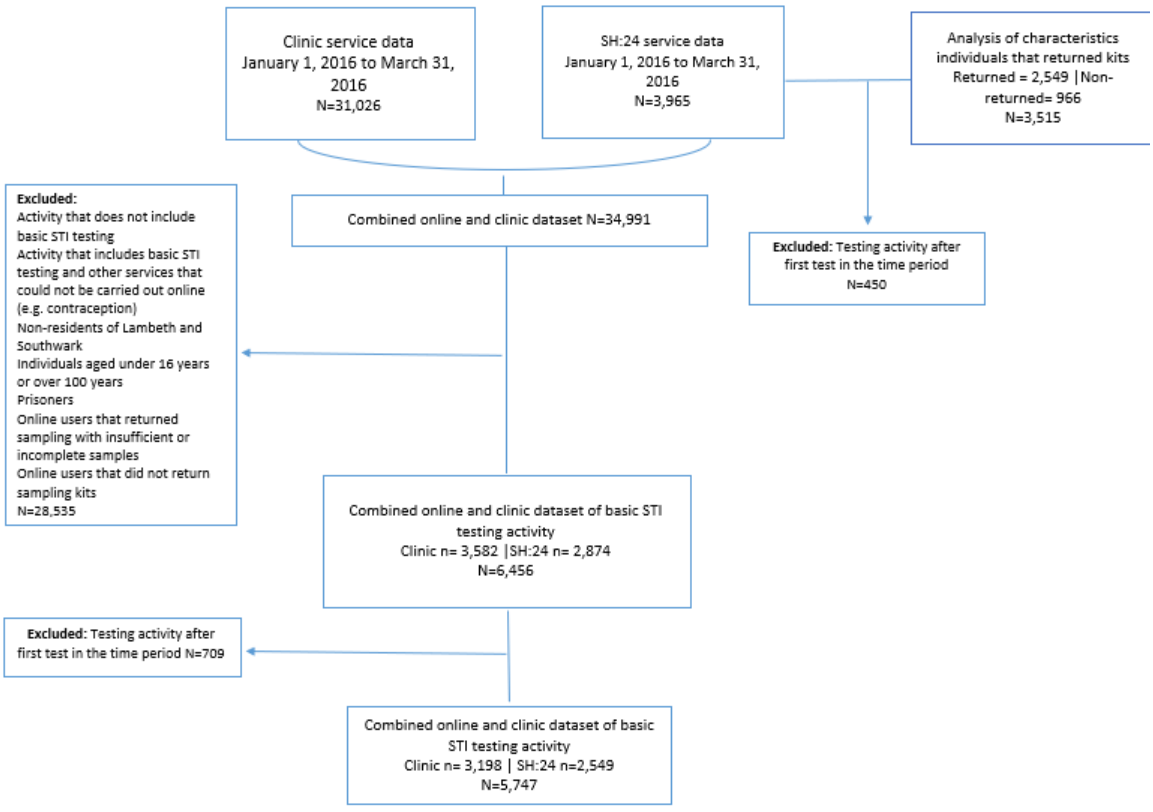
Data were included for residents of Lambeth and Southwark with Sexual Health & HIV Activity Property Type (SHHAPT) codes for testing for HIV, syphilis, chlamydia or gonorrhoea, or any combination of these four tests (P1A, T1, T2, T4, T3, T7, TT) [222]. Because in clinics STI testing codes are often accompanied by coding for advice and health promotion, we included any testing or diagnostic activity which included these codes (D3, P1B, P1C, P3, SW, SRH, T9). Service use that included coding for any other STI testing (T5, T6, T7, T10, TS) was excluded. Service use that was accompanied by codes for presence of symptoms, more complex cases (e.g. C4N or C5) or any additional services was excluded. The coding algorithm was developed with input from external local clinicians and academics via discussion in face to face meetings. The algorithm was developed to reflect comparable testing between online and clinic services. SHHAPT code lookups are available in Appendix K. SHHAPT codes were accurate at the time of the study, although since completing the study some have been retired [223]. Testing activity from

prisoners was excluded because clinic access was not available to prisoners. Covariate analysis only included an individuals' first test within the time period.

The main analysis compared those who completed a test using the online service and those who completed a test using the clinic services. We excluded data for online users that did not return the sample for testing and samples that were returned but were insufficient to test. Any individual who returned at least one sample for testing that was sufficient to test within six weeks of ordering the test was considered as having completed a test (returner). Any individual who did not return any sample for testing within six weeks, or an individual who returned only insufficient samples for testing was considered as not having completed a test (non-returner).

For the analysis of online services, returners were compared with non-returners. Figure 5.1 shows a flow chart how the datasets were generated for analysis and exclusion criteria.

Figure 5.1 flow chart of inclusion criteria



5.4 OUTCOMES

The outcome variable for type of service use was derived from the dataset of origin. Data from clinic services were combined to create a 'clinic users' category while data from SH:24 service formed the 'online users' category. For the analysis of online service users, online testing service users were defined as returners or non-returners.

5.5 COVARIATES

Age was measured in five-year intervals 16-<20, 20-<25, 25-<30, 30-<35 and 35+ years for ease of interpretation. An ethnic group variable was derived with the aim of generating fewer categories while representing the largest ethnic groups in the boroughs. Gender and sexual orientation were presented as they were reported. Data were included for positive test results for chlamydia and gonorrhoea diagnoses as any activity with a SHHAPT code “C4 “and/or “B. Data for reactive results for HIV and syphilis tests were not included in the analysis because at the time of the study, reactive results for HIV and syphilis were subsequently retested and confirmed in clinic services.

Index of Multiple Deprivation (IMD) quintiles was considered at Lower Super Output Area (LSOA) level [26]. IMD scores for each LSOA are derived from seven domains of deprivation that include the weighted average of income, employment, education, health, crime, barriers to housing and services and living environment. Scores are assigned to geographical areas, including LSOAs. LSOAs consist of an average of 1500 people [224]. A relative rank of IMD score for each area based on a local or national scale is then derived. For this analysis, these were analysed as IMD quintiles based on relative national rank. An individual’s IMD score and relative rank is associated with their postcode, rather than them as an individual. This is therefore an area level variable, limiting its interpretation within an individual level model [225].

5.6 STATISTICAL ANALYSIS

All analyses were conducted with the use of STATA 14.1 (Stata Corporation, College Station, Texas, USA).

Descriptive statistics were carried out using the Chi-Square test of independence (X^2). The X^2 test is a non-parametric significance test. It is not dependant on the distribution of the data and is therefore suitable for use with categorical data [226]. The test assumes the categories of the variables are mutually exclusive and the outcome categories are independent from each other [226]. It is appropriate for use when the value of at least 80% of cells in the table exceed five. Because the categories for all co-variates were mutually exclusive, the outcome of online service use was independent from clinic service use and the sample was large, the X^2 test was an appropriate method for statistical testing.

Once descriptive statistics were completed, unadjusted logistic regression models were used to explore potential associations between type of service use (clinic vs online) and age group, gender, ethnic group, sexual orientation and IMD quintiles. Multivariable logistic regression models were then used to examine the strength of these associations, controlling for confounding. To avoid an excess number of variables and unstable estimates in our models, only variables with a p value of <0·1 were retained [227].

Binary logistic regression models were employed because the outcome variable was binary (use of online services or use of clinic services) and there were multiple exposure variables. The model assumes that the observations are independent of each other and the exposure variables are not highly correlated with each other [228]. The data met these assumptions because individuals were independent from each other and the correlation between demographic variables was low. It produces probabilities on the log scale and requires linearity of exposure variables and log odds. The results of logistic regression are expressed as odds, which have been anti-logged back to the original scale.

Effect modification occurs when the effect of the exposure on the outcome is modified by another exposure variable in the model [228]. The effect of age group, gender, ethnic group, sexual orientation and IMD quintile on the relationship between each exposure and online service use was assessed for effect modification using two-way interaction terms within the regression model. Stratum specific estimates were presented if where effect modification was detected.

To investigate the factors influencing sample return amongst those accessing online services logistic regression methods were used to explore the association between return of kits (returners vs non-returners) and age group, gender, ethnic group, sexual orientation and IMD quintile.

Data were incomplete for only 21 (0.4%) observations therefore complete case analysis was carried out.

RESULTS

5.7 COMPARING USERS OF ONLINE SERVICES TO USERS OF CLINIC SERVICES AMONG STI TESTERS

A total of 6,456 STI tests were conducted among residents of Lambeth and Southwark between January 1, 2016 and March 31, 2016; 3,582 (55.5%) in clinic and 2,874 (44.5%) through the online service. In clinics, 384 (10·7%) individuals were tested on two or more occasions whereas in the online service the equivalent number was 449 (11·3%). The total number of unique individuals that used online or clinic services for STI testing was 5,747, 3,258 (56·7%) of whom were female. Individuals were aged between 16 to 85 years (median=27; inter-quartile range=23,32). The proportion of those testing positive for chlamydia (13.5% in clinic vs 3.4% online) or gonorrhoea (4.4% in clinic vs 3.1% online). Descriptive statistics are presented in Table 5-1.

Users aged between 20 and 30 years were more likely to use online services compared to both younger people and people aged over 35 years. Women were more likely to use online services compared to men (adjusted Odds Ratio (adjOR=1·82 95%CI 1·63, 2·10). Those who used online services were more likely to be white British than any other ethnic group. Homosexual and bisexual male and female users were more likely to use the online service compared to heterosexual users, although people reporting their sexual orientation as unknown were also less likely to use online services than the clinic service (adjOR=0·36 95%CI=0·24, 0·55). Those that tested positive for chlamydia or gonorrhoea were less likely use the online service compared to the clinic service (adjOR=0·30 95%CI=0·24, 0·38). Residents of areas with a higher IMD quintile (less deprived) were more likely to use online services (adjOR=1·09 95%CI=1·02, 1·17). Crude and adjusted ORs are presented in Table 5-2.

There was evidence that gender modified the effect of ethnicity (p=0·006) as well as the effect of sexual orientation on service use (p=0·017) therefore multivariate analysis is presented stratified by gender Table 5-2. Among women, being mixed white black African or Caribbean was not significantly associated with lower odds of using online services, while this was the case for men (adjOR=0.51 95%CI=0.30, 0.86). Among women, being homosexual increased the likelihood of online service use (adjOR=5.05 95%CI=2.55,10.00) more than it did for men (adjOR=1.83 95%CI=1.45,2.31).

Table 5-1: Socio-demographic characteristics of individuals who tested for sexually transmitted infections in clinics and through online services in Lambeth and Southwark between January 1st and March 31st 2016 N=5,747

Exposure variable	No. of clinic users (%)	No. of online users (%)	Total users (%)	p value (X^2)
Age group (years)				
16-20	257 (8·0)	101 (4.0)	358 (6·2)	<0·001
20-25	746 (23·3)	770 (30·2)	1,516 (26·4)	
25-30	844 (26·4)	954 (37·4)	1,798 (31·3)	
30-35	500 (15·6)	395 (15·5)	895 (15·6)	
35+	851 (26·6)	329 (12·9)	1,180 (20·5)	
Gender				
Male	1,578 (49·3)	911 (35·7)	2,489 (43·3)	<0·001
Female	1,620 (50·7)	1,638 (64·3)	3,258 (56·7)	
Ethnic group				
White British	751 (23·5)	1,482 (58·3)	2,233 (38·9)	<0·001
White other	505 (15·8)	324 (12·7)	829 (14·4)	
Black African	444 (13·9)	116 (4·6)	560 (9·7)	
Black Caribbean	314 (9·8)	166 (6·5)	480 (8·4)	
Black other	399 (12·5)	97 (3·8)	496 (8·6)	
Mixed white black African or Caribbean	101 (3·2)	124 (4·9)	225 (3·9)	
South Asian	54 (1·7)	36 (1·4)	90 (1·6)	
Any other ethnic group	430 (13·5)	170 (6·7)	600 (10·4)	
Not stated	200 (6·3)	29 (1·1)	229 (5·2)	
Sexual orientation				
Heterosexual male	1,161 (36.3)	598 (23.46)	1,759 (30.6)	<0·001
Heterosexual female	1,487 (46.5)	1, 485 (58.3)	2,972 (51.7)	
Homosexual male	307 (9.6)	271 (10.6)	578 (10.4)	
Homosexual female	12 (0.4)	61 (2.4)	73 (1.3)	
Bisexual male	33 (1.0)	32 (1.3)	65 (1.1)	
Bisexual female	32 (1.0)	68 (2.7)	100 (1.7)	
Unknown	166 (5·2)	34 (1·3)	200 (2·5)	
Tested positive for Chlamydia	482 (13.5)	97 (3.4)	579 (10.0)	<0.001
Tested positive for Gonorrhoea	159 (4.4)	39 (1.4)	198 (3.1)	<0.001
IMD quintile				
1 (Most deprived)	1,324 (41·5)	791 (31·1)	2,115 (36·8)	<0·001
2	1,272 (39·9)	1,122 (44·2)	2,394 (41·7)	
3	480 (15·1)	494 (19·4)	974 (17.0)	
4	102 (3·2)	117 (4·6)	219 (3·8)	
5 (Least deprived)	12 (0·4)	17 (0·7)	29 (0·5)	
Total	**3,198 (55·7)**	**2,549 (44·3)**	**5,747**	

IMD= Index for multiple deprivation

Missing data for 16 observations for IMD and 8 observations for ethnic group

Table 5-2 Crude and adjusted odds of use of online services compared to use of clinic services for STI testing in Lambeth and Southwark by age group, gender, ethnic group, sexual orientation, positivity and stratified by gender.

Exposure variable	**Total population N=5, 726**		**Men only (N=2,481)**	**Women only (N= 3,245)**
	Crude OR (95% CI)	Adjusted OR^ (95% CI)	Adjusted OR^^ (95% CI)	Adjusted OR^^ (95%CI)
Age group (years)				
16-20	1 (ref)	1 (ref)	1 (ref)	1 (ref)
20-25	2·63** (2·04, 3·38)	2·11** (1·77, 3·08)	1·71* (1·00, 2·94)	2·42** (1·73, 3·39)
25-30	2·88** (2·24, 3·69)	2·33** (2·03, 3·50)	2.10* (1·24, 3·56)	2·45** (1.75, 3·43)
30-35	2·01** (1·54, 2·62)	1·65** (1·43, 2·57)	1·47 (0·85, 2·54)	1.77* (1·23, 2·56)
35+	0·98 (0·76, 1·28)	0.88 (0·78, 1·39)	0·81 (0·47, 1·39)	0.91 (0·63, 1·32)
Gender				
Male	1 (ref)	1 (ref)	-	-
Female	1·75** (1·57, 1·95)	1·82** (1·63, 2·10)	-	-
Ethnic group				
White British	1 (ref)	1 (ref)	1 (ref)	1 (ref)
White other	0·33** (0·28, 0·38)	0·34** (0·29, 0·41)	0·36** (0·28, 0·48)	0·34** (0·27, 0·42)
Black African	0·13** (0·11, 0·17)	0.18** (0.15, 0.23)	0·17** (0·12, 0·24)	0·19** (0·14, 0·26)
Black Caribbean	0·27** (0·22,0·33)	0·36** (0·29, 0·45)	0·26** (0·18, 0·37)	0·44** (0·33, 0·58)
Black other	0·12** (0·98, 0·16)	0·16** (0·12, 0·20)	0·09** (0·06, 0·15)	0·21** (0·15, 0·29)
Mixed white black African or Caribbean	0·62* (0·47, 0·82)	0·71* (0·53, 0·95)	0·51* (0·30, 0·86)	0·83 (0·58, 1·19)
South Asian	0·34** (0·22, 0·52)	0·41** (0·26, 0·65)	0·51* (0·27, 0·93)	0·32** (0·17, 0·62)
Any other ethnic group	0·20** (0·16, 0·24)	0·22** (0·18, 0·27)	0·26** (0·19, 0·36)	0·20** (0·15, 0·26)
Not stated	0·07** (0·50, 0·11)	0·09** (0·06, 0·13)	0·06** (0·03, 0·14)	0·10** (0·06, 0·17)
Sexual orientation				
Heterosexual	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Homosexual	1·32* (1·12, 1·56)	2.23** (1·81, 2·74)	1.83** (1.45, 2·31)	5·05** (2·55, 10·00)
Bisexual	1·96** (1·42, 2·69)	2·10** (1·47, 3·01)	2·23* (1·28, 3·87)	1·90* (1·20, 3·04)
Unknown	0·26** (0·18, 0·38)	0·36** (0·24, 0·55)	0·46* (0·23, 0·93)	0·33** (0·20, 0·54)
Tested positive for chlamydia or gonorrhoea				
No	1 (ref)	1 (ref)	1 (ref)	1 (ref)
Yes	0.27**(0.22, 0.33)	0.30** (0.24, 0.38)	0.35** (0.25, 0.49)	0.26** (0.19, 0.37)
IMD quintile	1·29** (1·21, 1·37)	1·09* (1·02, 1·17)	1·12* (1·00, 1·24)	1·07 (0·98, 1·18)

*p= ≤0·05;

**p= ≤0·001;

^Adjusted for age group, gender, ethnic group, sexual orientation, IMD quintile, tested positive for chlamydia or gonorrhoea;

^^ Adjusted for age group, ethnic group, sexual orientation, IMD quintile, tested positive for chlamydia or gonorrhoea.

OR= odds ratio, IMD= Index for multiple deprivation. Missing data for 16 observations for IMD and 8 observations for ethnic group. Missing data excluded from multivariate analysis.

IMD quintile range 1=5 where 1= most deprived and 5= least deprived entered into the model as a continuous variable (base=1).

5.8 COMPARING RETURNERS AND NON-RETURNERS AMONG USERS OF THE ONLINE SERVICE

In the analysis of the online service, of the 3,515 individuals who ordered a kit from the online service, 2,549 (72·5%) returned a sufficient sample to the laboratory. Descriptive statistics are presented in Table 5-3. In multivariate analysis, age group and ethnic group were associated with returning a sample. Those most likely to return a sample were aged over 20 years (p=<0·05). Compared to white British individuals, black African (adjOR=0·70 95%CI=0·50, 0·98), mixed white black African or Caribbean (adiOR=0·64 95%CI=0·47, 0·88), any other ethnic group (adiOR=0·58 95%CI= 0·44, 0·76) and those that did not state their ethnic group (adjOR=0·50 95%CI= 0·28, 0·91) were less likely to return a sample for testing. Crude and adjusted ORs of returning a sample are presented in Table 5-3.

Table 5-3 Number, proportion and determinants of returning self-sampling kits among users of online services for self-sampling for STIs at home.

Exposure variable	No. of un-returned kits n (%)	No. of returned kits n (%)	Crude OR (95% CI) N=3,964	Adjusted OR ^ (95% CI) N=3947
Age Group				
16-20	71 (7·4)	101 (4.0)	1 (ref)	1 (ref)
20-25	294 (30·4)	770 (30·2)	1·84** (1·32, 2·57)	1·64* (1·17, 2·30)
25-30	340 (35·2)	954 (37·4)	1·97** (1·42, 2·47)	1·77* (1·27, 2·48)
30-35	128 (13·3)	395 (15·5)	2·17** (1·51, 3·12)	1.97** (1·36, 2·85)
35+	133 (13·8)	329 (12·9)	1·74* (1·21, 2·50)	1·63* (1·12, 2·38)
Gender				
Male	374 (38.7)	911 (35.7)	1 (ref)	1 (ref)
Female	592 (61.3)	1,638 (64.3)	1.14 (0.98, 1.32)	1·18 (1·00,0·39)
Ethnic Group				
White British	488 (50·6)	1,482 (58·3)	1 (ref)	1 (ref)
White other	111 (11·5)	324 (12·7)	0·96 (0·76,1·22)	0·95 (0·75, 1·21)
Black African	58 (6·0)	116 (4·6)	0·66* (0·47, 0·92)	0·70* (0·50, 0·98)
Black Caribbean	69 (7·2)	166 (6·5)	0·79 (0·59, 1·07)	0·84 (0·62, 1·13)
Black other	37 (3·8)	97 (3·8)	0·86 (0·58, 1·28)	0·92 (0·62, 1·36)
Mixed white black African or Caribbean	68 (7·1)	124 (4·9)	0·60* (0·44, 0·82)	0·64* (0·47, 0·88)
South Asian	14 (1·5)	36 (1·4)	0·85 (0·45, 1·58)	0·93 (0·49, 1·74)
Any other ethnic group	100 (10·4)	170 (6·7)	0·56** (0·53, 0·73)	0·58** (0·44, 0·76)
Not stated	19 (2.0)	29 (1.1)	0.50* (0.28, 0.90)	0·50* (0.28, 0·91)
Sexual Orientation				
Heterosexual male	245 (29.1)	598 (70.9)	1 (ref)	-
Heterosexual female	532 (26.4)	1,485 (73.6)	1.14 (0.96, 1.37)	-
Homosexual male	102 (27.4)	271 (72.7)	1.09 (0.83, 1.43)	-
Homosexual female	21 (25.6)	61 (74.4)	1.19 (0.71, 2.00)	-
Bisexual male	15 (31.9)	68 (73.1)	0.87 (0.47, 1.64)	-
Bisexual female	25 (26.9)	68 (73.1)	1.11 (0.69, 1.80)	-
Not stated/Not known	26 (43.3)	34 (56.7)	0.54 *(0.31, 0.91)	-
IMD Quintile -				
1 (most deprived)	325 (33·8)	791 (31·1)	1 (ref)	-
2	418 (43·4)	1,122 (44·2)	1·10 (0·93, 1·31)	-
3	186 (19·3)	494 (19·4)	1·09 (0·88, 1·35)	-
4	29 (3·0)	117 (4·6)	1·66* (1·08, 2·54)	-
5 (least deprived)	5 (0·5)	17 (0·7)	1·40 (0·51, 3·81)	-

Total	**966 (27·5)**	**2,549 (72·5)**		

*p=<0·05;
**p=<0·001;
^ Adjusted for age group, gender and ethnic group.
OR= odds ratio, IMD= Index for multiple deprivation. Missing data for 11 observations for IMD and 7 observations for ethnic group. Missing data excluded from multivariate analysis.

DISCUSSION

5.9 Summary of findings

Uptake of online services was high, with 44.5% of all basic STI testing being carried out online. However, this study shows differential use of online services for STI self-sampling at home between socio-demographic groups. Some higher-risk groups including young people aged between 20 and 25 years and MSM used online services. Other higher-risk groups including young people aged between 16 and 20 years and BME groups were more likely to use clinic services for STI testing than online services, and there are lower levels of positive diagnoses of chlamydia and gonorrhoea seen in users of the online service. There was a small effect of area-level IMD on use of online services, indicating individuals from wealthier neighbourhoods are more likely to use online services compared to clinic services. Among individuals who ordered a self-sampling kit from the online service, those most likely to return kits for testing were aged over 20 years and white British.

5.10 Strengths and weaknesses of the study

This is the first study to compare individual level data from clinic and online sexual health services for STI testing to identify key socio-demographic factors associated with online service use in a real-world setting. The main strength of this study is that the sample size is large, and that clinicians and external academics here consulted to define outcome variables. However, there are some weaknesses. The dataset does not include data from STI testing in GPs, so the study is limited to comparing online users to sexual health clinic users. Surveillance data does not contain unique identifiers; therefore, it is not possible to link treatment of positive cases in clinics to testing for online service users. Individuals cannot be matched between clinic services so the same individual may appear more than once in the clinic cohort. Finally, a key limitation of GUMCADv2 data is that it does not contain any behavioural data, therefore analysis is limited to socio-demographics. Additionally, in the online service and two of the clinic services, users reported their characteristics via computer terminals while other services used face-to-face interviewing. This may have led to a reduction in the reporting of characteristics more sensitive to stigma such as sexual orientation and ethnic group clinic services, resulting in an underestimation of use of clinic services among bisexual and homosexual men and women and for BME groups [229].

5.11 Findings in relation to other studies

Few studies have compared the characteristics of online users to clinic users. Since conducting the literature review, presented in Chapter 3, further evidence has been published. Two RCTs have investigated the effectiveness of online services on uptake of testing, both report similarities in the characteristics of online users and clinic users [218, 230]. In the UK, an RCT investigating the same online service as our study (SH:24) reported no differences in uptake between socio-demographic groups. It reported a reduction in time to test but not time to treatment in the online arm and good follow up (84%), however it lacked power to detect differences in STI diagnoses between online and clinic arms [218]. In

France, an RCT investigating an intervention to encourage chlamydia testing via an online service on uptake of testing suggested the intervention had a greater effect on men, though no other differences in the uptake between groups were observed [230]. However, this may be subject to bias due to low follow up (30%) [230]. Finally, in a study published after this study was published, differences between the socio-demographic characteristics of users of an online and clinic services and lower positivity of chlamydia and gonorrhoea infection was seen in the online service [231]. However, this study only presents univariate analyses, and it is not clear what methods were used to ensure that clinic and online users were comparable [231].

Other observational studies in the UK, USA, France and Sweden have described characteristics of users of online services for self-sampling at home [90, 179, 232, 233]. An observational study linked to the French RCT reported similar findings to our study [234]. In Sweden, a similar online service saw 74.5% of kits returned by a majority of female users and young people aged under 25 years [232]. Studies in the UK and USA have reported high use of online services among BME, low income groups and MSM and high positivity, but lower return rates [90, 179, 233]. While there are some similarities in these results, any differences may be a result of a variation in context, for example, the US studies evaluated service that was free of charge to users within a predominantly private medical context. Possible mechanisms and implications

Differences in findings between trials and observational studies may reflect the equitable information that trial participants receive, irrespective of their socio-demographic characteristics. In real-world settings some groups may have less information about services than others, which could result in differential uptake between groups [218]. These differences may also reflect that the French RCT recruited all participants online and the UK trial recruited 54% of participants online, therefore both of the trial populations may have higher levels of acceptance of online services [218].

The analysis presented in this chapter has demonstrated that barriers to online service use exist both before someone orders a self-sampling kit and during the process of self-sampling and returning of kits. It also demonstrates that these barriers influence sociodemographic groups differently. It is unable to determine what the barriers are. Further research is needed to understand other predisposing social and belief factors and the enabling and need factors that may influence service use. Existing evidence from qualitative studies have highlighted possible barriers to use of online services among potential service users. These include predisposing and enabling factors and include concerns about: concealment of service use that involves receiving a package at home or a message on mobile phones; data security; need for professional support during sampling, and accuracy of the test [92, 170, 181]. These concerns may be particularly important for young people [170] and BME groups [181]. Additionally, potential concerns about ability to use the kit correctly have been reported as a barrier to self-sampling [170, 181]. These qualitative studies give some indication of what the barriers to online STI testing could be, although they investigate intention to use an intervention which is not yet available.

5.12 Rationale for further research

PHE recommends that innovations for STI testing should aim to increase access to STI testing among groups at higher risk of infection [43]. Evidence from this chapter suggests that at this early stage of service implementation online services are used less by some higher-risk groups. This may reflect inequitable barriers to service use between groups, including differential information between groups. However, differences could be a result of appropriate service use, for example, when additional services are being sought which are not available online, such as HPV or Hepatitis B vaccination for MSM [235]. Lower diagnoses among online service users may reflect appropriate signposting from online services, advising symptomatic users to attend clinics for testing. Differences in access that are a result of user choice or appropriate signposting are acceptable and would not indicate inequitable access. Further work is needed to understand the underlying reasons for differences in access between groups.

Chapter 6 EXPLORING THE FACTORS THAT INFLUENCE ACCESS TO ONLINE SERVICES FOR SELF-SAMPLING AT HOME: SERVICE USER INTERVIEWS

INTRODUCTION

Chapter 5 presents evidence of differences in access to online services between demographic groups. This chapter explores the underlying reasons for these differences in access through qualitative interviews. It explores potential and realised access to services. It investigates the process of access through the exploration of barriers and facilitators to access that are associated with the individual and those that are associated with the service.

Interviews are carried out among participants of the 'Gettested' Trial that were allocated to the intervention arm. They represent a population that were given equal information about the service. They are an important population for investigation of equity of access because interviews can explore reasons for non-use of service that are acceptable, and those that are unacceptable.

Analysis of interview data generated major themes that represent the barriers and facilitators to use of online services. The findings then go on to describe the domains and sub-domains within these themes. The discussion uses the Andersen's Model for Access to Medical Care as a framework to organise the findings and discusses the findings in relation to other studies in the field.

AIMS

To explore the barriers and facilitators to use of online services for self-sampling at home among users of the service.

To identify the key themes that influence access to inform the development of a measurement tool for access to online services.

METHODS

6.1 DATA COLLECTION

This study involved semi-structured interviews with individuals who were invited to use the online service for STI self-sampling at home. Interviews, as a method of data collection, were selected over focus groups because the nature of the data being sought related to individual experiences. Additionally, the topic area of STI testing and sexual health could be sensitive to some participants and may be more suited to individual interviews [236]. Semi-structured interviews were employed because they allow for the exploration of perceptions and opinions regarding sensitive topic areas and enable probing [237].

6.2 STUDY SETTING

Twenty semi-structured qualitative interviews were conducted in the London boroughs of Lambeth and Southwark. All interviews took place between November 2015 and May 2016 within private meeting rooms

at King's College London, Denmark Hill campus. In one case, a participant was interviewed over the phone due to restrictions on travel. Interviews lasted between 40 minutes and 1 hour 20 minutes. More detailed information about the study setting can be found in Chapter 4. The information and consent for participants is available in Appendix L and M respectively.

6.3 SAMPLE SELECTION AND RECRUITMENT

6.3.1.1 SAMPLING FRAME

The sampling frame was an existing list of participants of the Gettested Trial who were allocated to the intervention arm and had indicated that they would like to take part in future research. Participants of the Gettested Trial were recruited from universities, colleges and through social media between November 2014 and July 2015. They were subject to inclusion criteria at the time of recruitment that restricted the trial study population to only residents of Lambeth or Southwark who were aged between 16 and 30 years, had at least one sexual partner in the past 12 months and who were willing to take an STI test. Those allocated to the intervention arm received a text message to encourage them to use online services for STI testing at home. Sampling from this population offered a unique opportunity to access individuals who had been explicitly offered the opportunity to use online services.

6.3.1.2 SAMPLING STRATEGY

A stratified purposive sampling strategy was used to invite participants to take part in interviews. The sampling strategy was designed to capture a range of experience and perspectives about online services. The criteria that were considered for purposive selection were: age; gender; sexual orientation, ethnic group, number of sexual partners in the past 12 months and whether the participant had used the online service during the trial period. Demographic criteria were employed to ensure a range of perspectives was sought from demographic groups because use of online services differs between demographic groups [238]. Use of the online service during the trial period was included in the purposive selection strategy to ensure data was collected about both barriers and facilitators to use of online services. Number of sexual partners in the past 12 months was included in the strategy to reach participants with different levels of risk for STI infection. The selection of participants was monitored carefully to ensure that the final sample met the requirements for a diverse range of experience and perspectives.

The target sample size was no fewer than 20 participants. This sample size reflected the descriptive nature of the study and its aim of informing content for CMS development [239]. Data description and collection occurred concurrently so that data could be monitored for new emerging themes. Data collection continued until no new themes emerged within the interviews. No new themes were identified after 18 interviews were completed. Data collection continued to complete 20 interviews to ensure no new themes emerged. Seven people were approached to take part in the interviews but refused to take part stating that they were not willing to travel to the venue for an interview.

6.4 INTERVIEWS

One interview was carried out with each participant. Participants were asked about their use or non-use of the online service, their use or non-use of the self-sampling kit and their experiences of STI testing both

online and in clinics. Semi-structured topic guides were developed with the intention of exploring both barriers and facilitators to access of online services that exist prior to accessing the site, during the use of the site, during the self-sampling process and receiving results remotely. Interview topic guides included six main areas for discussion:

- General experiences, expectations and beliefs about online services for STI testing
- Acceptability, user friendliness, interpretation and reliability of online services
- Receiving results from STI testing
- Information and support for STI testing
- Perceived need for testing
- Scenarios around getting tested for STIs

Interview topic guides were developed to address the different tasks involved in using the online service and by drawing on findings from the scoping review presented in Chapter 3. Interview topic guides can be found in Appendix N.

Audio recordings were made for all but two interviews. All audio recordings were fully transcribed. One participant declined audio recording therefore detailed notes were taken during the interview. Another participant requested a telephone interview therefore detailed notes were taken during the telephone call.

6.5 REMUNERATION

Participants received £20 cash remuneration for taking part in the survey. This amount is in line with similar qualitative studies in the field of self-testing in the UK and compensates for the study taking one hour of the participants time and the costs of travel [149].

6.6 THE ROLE OF THE INTERVIEWER

Because interviews involve an interaction between the characteristics and values of both the participant and the interviewer, it is important to acknowledge the potential effects on reflexivity of the interviewer's social position, personal experiences and professional beliefs [236, 240, 241]. A social constructivist perspective was adopted. Social constructivism asserts that reality is socially constructed and subjective to the individual, knowledge is socially and culturally constructed, and learning is a social process [242].

The interviewer was a female, white other, a PhD student, aged 35 years and was not affiliated with any service. This was her first experience of carrying out qualitative interviews. She explained to interviewees that she did not represent the online service, or any clinical service and that the aim of the research was to identify ways to improve service delivery. The interviews were conducted in a university setting so that participants did not associate the place of the interview with any service. Self-sampling kits and access to the online website were both available during interviews to enable interviewees to identify specific aspects of the service which may act as barriers or facilitators to use. The interviewer facilitated access to the website and sampling kits and discussed if and how the participant had used them in the past. This was not possible for one interview that was carried out over the telephone.

One interviewer (SB) carried out all 20 interviews, therefore interviewers could not be matched with participants on gender or any other criteria. The interview context was shaped by the social and demographic characteristics of the interviewer. The interviewer did not form part of the community or population group within the study therefore participants may have felt more open to sharing information on sensitive issues [236]. She was older than participants, not a resident of Lambeth or Southwark, of white ethnicity and had an Australian accent. The difference in age, residence and geographical background of the interviewer from the interviewees may have enabled participants to describe their experiences without feeling social stigma from a community member [243]. However, these differences may also have limited the interviewer's ability to interpret and understand the perspectives of the participants [243]. In some interviews a power imbalance may have existed because of differences in educational background between the interviewer and the participant [240, 244]. This could have been amplified by the location of interviews being in a university setting [244]. The interviewer attempted to address some of this imbalance by ensuring that the participant was aware of data confidentiality and that the interview could be terminated by them at any point and there would be no repercussions [244]. Additionally, participants were assured that responses would in no way affect their clinical care.

6.7 ANALYSIS OF INTERVIEW DATA

Data were analysed using QSR NVIVO 11, a qualitative software package. The primary objective of the interviews was to identify the key barriers and facilitators to use of online services. Thematic analysis was used to report the experiences and meanings expressed by participants [245]. Thematic analysis is a method of analysis used in qualitative research to identify, analyse and report patterns (themes) within data [240, 245]. A hybrid approach to thematic analysis that included both an inductive data driven approach and a deductive template of codes approach was used [246]. This approach was used as a means of organising the data derived from interviews for subsequent interpretation [246]. This approach to analysis was used over other common methods of analysis such as grounded theory or framework analysis because the aim of the research was to identify key themes within the data rather than generate substantive theory or policy related findings [240]. Although the analysis in this chapter is presented as a linear procedure, it was an iterative and reflexive process.

Transcripts were written verbatim and anonymised. Raw data within transcripts were formatted. Using the inductive approach transcripts were read in detail and initial themes were generated by bringing together components of ideas or experiences described by the participants [247]. Related themes were then combined and catalogued into sub-themes and checked for emerging patterns. The refinement of themes was done by a process of reading and re-reading data as well as consultation with existing literature about access to health services and access to sexual health services as well as consultation with colleagues. Data were then re-read and any text that exemplified one of the themes was categorised under one, or more of the codes. Attention was also paid to the identification of possible new codes during this phase. Finally, differences and commonalities within and across code categories were examined [245]. This process required several iterations.

Ten transcripts were second coded by two additional researchers (Dr Paula Baraitser and Professor Caroline Free). The ten transcripts were selected to represent different demographic groups and use of

services among participants. Transcripts were read and coded by the second coders. A meeting was arranged between the first coder and both second coders. During the meeting, coding of themes was discussed in detail and any discordant views were resolved within the meeting.

Findings were then interpreted in relation to Andersen's Model for Access to Medical Care using a deductive template approach [97, 246]. A template in the form of superordinate codes derived from the components within Andersen's Model for Access to Medical Care (predisposing, enabling and need) was derived as a means of organising the text and themes derived from the inductive process [97, 246]. The template was developed a priori, based on the research question and the theoretical framework. The interpretation of themes in relation to the framework is presented in the discussion.

FINDINGS

6.8 POPULATION

SB interviewed 20 service users. Table 6-1 presents the sampling framework. Of the 20 participants, nine did not place an order for an STI test with the service, six placed an order but did not return the sample and five placed an order and returned the sample. Sixteen of those interviewed reported having least one STI test prior to taking part in the study although none of them had used online services for STI testing. Four participants had never had an STI test prior to taking part in the trial. All 20 participants reported having at least one sexual partner in the past 12 months, and of these, 10 had more than five partners while 10 had fewer than five. No participants tested positive for infection in the Gettested Trial. Table 6-2 presents the demographic characteristics of those that were interviewed.

Young people aged between 16-19 years were particularly difficult to recruit in this study. Of the 1430 participants of the Gettested Trial who were willing to be contacted for future studies, 263 (18.39%) were aged 16-19 years. When trying to contact this group, mobile numbers were often unavailable or disconnected. Many of those who were contactable had moved residence and were not willing to take part in the interviews. Only one out of the 263 individuals aged 16 – 19 years in the sample frame expressed willingness to be interviewed. It was therefore deemed necessary to alter the interview procedure according to this participant's requirements. This participant was interviewed by telephone because he had since moved to another city in the UK and was unwilling to travel.

Table 6-1: Sampling Framework

	Did not order (DNO) n=9	Did not return (DNR) n=6	Ordered and returned(OR) n=5	Total N=20
Gender				
Male	5	4	3	12
Female	3	2	2	7
Transgender	1	-	-	1
Age				
16-19	1	-	-	1
20-24	4	5	1	10
25-30	4	1	4	9
Sexual orientation				
Heterosexual	5	4	4	13
Bisexual	2	-	-	2
Homosexual	2	2	1	5
Ethnic Group				
White	3	1	4	8
Mixed	2	-	1	3
Asian	1	1	-	2
Black	3	3	-	6
Other	-	1	-	1

Table 6-2: Characteristics of Participants

Participant number	Age Group (years)	Gender	Sexual Orientation	Ethnic Group	When was your last STI test?	Where was your last STI test?	No. of sexual partners (past 12 months)	Trial status	Tested positive for infection in trial
001	25-30	Transgender	Homosexual	Mixed any other	3-6 months	SH clinic	10+	Did not order kit	n/a
003	20-24	Female	Heterosexual	Mixed white/black	6-12 months	SH clinic	1	Returned kit	No
005	25-30	Female	Heterosexual	white	6-12 months	GP	2	Returned kit	No
006	25-30	Male	Heterosexual	white	6-12 months	SH clinic	5	Returned kit	No
007	20-24	Male	Heterosexual	Arab	Last 3 months	Hospital	5	Did not return kit	n/a
008	16-19	Male	Heterosexual	black British	Never	-	2	Did not order kit	n/a
010	25-30	Male	Homosexual	white	Never	-	6	Returned kit	No
011	25-30	Male	Heterosexual	white	3-6 months	SH clinic	5	Returned kit	No
012	20-24	Male	Heterosexual	black British	Never	-	5	Did not return kit	n/a
013	20-25	Male	Homosexual	Asian	3-6 months	SH clinic	4	Did not return kit	n/a
015	25-30	Female	Heterosexual	black/African	3-6 months	SH clinic	2	Did not return kit	n/a
016	20-24	Female	Heterosexual	black Caribbean	Last 3 months	Internet service	1	Did not return kit	n/a
017	20-24	Male	Bisexual	white/other	3-6 months	SH clinic	10+	Did not order kit	n/a
019	20-24	Female	Bisexual	Mixed black/white African/Caribbean	3-6 months	SH clinic	5	Did not order kit	n/a
021	20-24	Male	Heterosexual	black African	3-6 months	SH clinic	1	Did not order kit	n/a
022	20-24	Female	Heterosexual	white	3-6 months	Other	1	Did not order kit	n/a
023	25-30	Male	Heterosexual	black African	more than a year	SH clinic	4	Did not order kit	n/a
024	25-30	Male	Homosexual	white other	3-6 months	SH clinic	10+	Did not order kit	n/a
025	25-30	Female	Heterosexual	Asian	Never	-	1	Did not order kit	n/a
026	20-24	Male	Homosexual	white	6-12 months	SH clinic	10+	Did not return kit	n/a

6.9 INTERVIEWS

The interviewer was able to elicit participants' views of online service delivery by ensuring participants were aware of the study aims. The data collected were often contradictory. Contradictions between individuals were expected because the sample represented different demographic groups. These contradictions are described in the data. Contradictions were also present within the same individual, for example a participants' views on the website often differed before and after they were shown it during interview. Contradictions within an individual are presented in the data within the context that they were made.

6.10 THEMES DESCRIBING BARRIERS AND FACILITATORS TO USE OF ONLINE SERVICES

Six overarching themes were identified. They describe the barriers and facilitators to use of online services for STI self-sampling at home. The themes were: trust in the STI testing service, subjective norms, privacy, self-efficacy, convenience and perceived risk. Within each of these themes, participants described how the factors relating to the individual interacted with the factors relating to the service to influence access. These are presented in the results as they were positioned by the participant. Therefore, within each theme, both individual and service-related factors are described. Due to the recursive and interactive nature of access to health services there is some level of overlap between themes. Where this occurs, it is highlighted within text. Themes and sub-themes are summarised in Table 6-3.

Table 6-3: Summary of Themes and Subthemes from Qualitative Interviews

Themes	Subthemes
Trust	Service Reliability
	Trust in health information
	Service confidentiality
	Improving levels of trust over time
Subjective Norms	Subjective norms
	Identity
	How subjective norms improve over time
Privacy	Privacy when testing
	How privacy differs between groups
Self-efficacy	Managing sexual health
	Use of the website and ordering a kit
	Self-sampling
	Validity of results and role of a healthcare provider
	Improving self-efficacy to self-sample
Convenience	Cost of use
	Comfort and control
	Ease of use
	Time to test
	Concealing testing
	Additional Services
Perceived Risk of Infection	Likelihood of having an infection
	Type of infection

6.10.1.1 TRUST

When considering which sexual health service to use for testing, participants considered their level of trust in the service. They described trust as a way to manage the uncertainty around the expectation that testing is carried out in a way that is both accurate and confidential [248]. Participants described their trust in different elements of the service. These included the reliability of the service, the confidentiality of the service and the quality of information it provided. Participants described their trust in relation to the context in which the service is delivered, either online or in clinic services, often comparing the two. Most participants described having lower levels of trust in services provided online than services provided in clinics.

> *P006 (male / heterosexual / white / aged 25-30 / returned a kit): … I suppose when you're ordering stuff online there's always something in the back of your mind if it's going to be 100% accurate*

6.10.1.1.1 Service reliability

Lower levels of trust in the reliability of the online service, compared to a clinic service was a prominent theme among participants. Reliability related to the process of testing, which included; sample labelling; sample delivery; notification of results and accuracy of results. Participants worried that online service staff would label their samples incorrectly. Concerns around the delivery of samples related to potential damage that would render results invalid or incorrect. These concerns were not present when participants used clinic services. For some participants, the characteristics of the online service that made it user friendly also posed a potential threat to the reliability of the service.

> *P016 (female / heterosexual / black Caribbean / aged 20-24 / did not return kit): I was a little bit apprehensive [about the online service] because once again I was [thinking], 'How are they going to […] Are they going to get my results right? Are they not going to mix it up?' It just seemed too easy.*

Many participants described a lack of trust in the postal service to deliver biological samples to the laboratory. They raised concerns about the potential for lost samples, which were generally considered to be highly valuable and confidential. A lost sample would result in an extended period of anxiety about the result of the test, and a potential breach of confidentiality. One male participant described concerns about the potential for infection risk from sending biological samples in the post. Participants that had previously lost an item using the postal service expressed lower levels of trust in it.

> *P026 (male / homosexual / white / aged 20-24 / did not return): It is a tricky one, because it is like when you go to the Post Office, they ask what is the value of the goods inside? "My health!" … something like this is priceless.*

> *P013 (male / homosexual / Asian / aged 20-25 years / did not return kit): I thought maybe [it would have] the potential for it to come open and infect someone.*

Among participants, a major consideration when using the online service was the accuracy of the test result. Participants expressed doubts about the accuracy of the test kit used by the online service. There

were also doubts about the reliability of the laboratory used by the online service, because it was assumed that it differed from the laboratory used by clinic services. Additionally, perceived accuracy of the result was dependant on self-efficacy to sample correctly. This dimension of trust is described in more detail under the theme 'self-efficacy'.

Participants using the online service were more concerned about potential false negative results than false positive results. Concerns about false negative results acted as a barrier to use because users would remain unsure about their STI status after the result. In the case of a positive result, participants described being willing to re-test in a clinic setting to 'check' the validity for the result.

> *P022 (female / heterosexual / white / aged 20-24 / did not order): I'd be more worried about a negative result because I'd just be like, "Oh maybe they just didn't find something," but I'd trust a positive.*

> *P024 (male / homosexual / white / aged 25-30 / did not order kit): I think in case I had any positive results I would probably go to the clinic and get it done, just to have it done by somebody else.*

6.10.1.1.2 Trust in the health information provided by the service

Participants relied on obtaining accurate information from sexual health services. This included information about risk of infection and prevention of future infections. Trust in the accuracy of information provided by sexual health clinic staff was higher than information provided by other services, including GPs and online services. In contrast, one transgender participant referred to their distrust in the information provided by clinic staff, suggesting their guidance is fuelled by a financial agenda that was at odds with quality of patient care, particularly around HIV risk and access to PEP and PREP. For this participant, their trust was higher in the information provided by online forums and patient activist groups.

> *P006 (Heterosexual / white / male / aged 25-30 / returned a kit): you're always [going to] trust a specialist instead of an overall medical field person. But you know [GP's have] still got more of an insight than I have- I still trust them, but I trust the GUM people more.*

> *P001 (Transgender / homosexual/ mixed any other / aged 25-30 years / did not order a kit): […] I would be canny about what I said to doctors in which services I used […] if you've been the insertive partner they'll be like 'no, no PEP' and there have been some cases of people then being HIV positive. And I think that's a bit scary.*

6.10.1.1.3 Service confidentiality

Privacy around testing was a major concern for most participants. This importance of privacy, in particular, social and institutional privacy is detailed within the theme 'privacy. Because of this concern, the confidentiality that a service provided was a major factor when deciding whether a service could be trusted. Even for those who expressed less concern about concealing their testing activity, privacy remained an important factor in their decision of which service to use. Concerns about service confidentiality related to data protection and, for the online service, whether the online service would deliver a testing package discretely.

The appearance and presentation of the service were used as a method of assessing the likelihood of adequate data protection. This related to trust. Most participants expressed a high level of trust in the data security provided by sexual health clinics. When using online services, participants evaluated whether they could trust the service to provide data security. Because the service is faceless, any assessment of data security was made by assessing the appearance of the website. Easy to navigate webpages and NHS branding increased trust in data security for some participants. In contrast, for one participant suggested NHS branding did not increase trust as he felt NHS branding could be applied by any organisation and therefore was not exclusively used by NHS services.

> *P005 (female / heterosexual / white / aged 25-30 years / returned kit): Definitely. I mean, I can't say I saw it there, but I know if, whenever I see NHS on anything, anywhere, I always… [trust it]*

> *P008 (male/heterosexual l/ black British / aged 16-19 years / did not order kit): I don't really trust it […] Anyone could use the NHS symbol- it doesn't mean anything.*

> *P026 (male/homosexual l/ white / aged 20-24 / did not return): Obviously you assume that the website is all legit and data protection and all that, so you are not standing in a queue and talking about it in front of people, there is no one else there, so I suppose that element of it is better, because then it is just private, personal, confidential*

There were also concerns about how the postal service would safeguard users' privacy. Participants were concerned that the sample that contained their data was in the possession of a non-medical service that was not bound by the same obligation to protect data as an NHS service. Participants had not considered whether or how samples were transported to a laboratory from a clinic service.

> *P013 (male/homosexual / Asian / aged 20-25 years / did not return kit): I would like to know some sort of guarantee to that just because it is going by post because I'm not sure what safeguards there might be in terms of confidentiality via post.*

6.10.1.1.4 Improving levels of trust in online services

Lower levels of trust in the online service were, in part, a result of it being a novel and new service. Many participants required evidence of effective service delivery to trust a new service. However, when some participants used the online service, the appearance and ease of use of the website, packaging and information leaflets improved levels of trust. After using the online service, some participants felt that it could manage samples effectively, provide appropriate test kits and maintain privacy.

> *P011 (male / heterosexual / white / aged 25-30 / returned kit): As people use it, you get more trust. It's when you're trialling something then that's when you have your guard up a bit more.*

> *P005 (heterosexual / white / female / aged 25-30 years / returned kit): I suppose if it had come and it was in a really shoddy packaging, or the instructions were a bit weird or whatever, I maybe would have doubted it, but I didn't really doubt it.*

6.10.1.2 SUBJECTIVE NORMS AND IDENTITY

For many participants, access to STI testing services was influenced by 'subjective norms' around testing. Subjective norms are perceived social pressures to engage or to not engage in a behaviour [143]. They influence both trust in services as well as self-efficacy to use the service. Among all participants, clinic services were described as the 'normal' place to get tested for STIs while online services were not yet considered to be normal. Suggestions from peers influenced use of online services both positively and negatively. Recommendations from peers increased users' trust and confidence to order online and self-sample.

> *P005 (heterosexual / white / female / aged 25-30 years / returned kit): I recommended it to my housemate, 'cause she wanted to get tested as well. She ordered one, did it, and then my other housemate did it as well a few weeks ago.*

However, one participant described how negative comments from peers could also discourage use of the online service. He had initially planned to use the service but changed his mind after a peer cast doubt over the data security and the potential for an outbreak of infection if he was to send samples in the post.

> *P007 (heterosexual / Arab/ male / 20-24 years / did not return kit): I didn't do the test in the end...I told one of my friends about it and they made it sound like it was quite a strange thing to like do, so I don't know […] and then I decided not to do it, but I probably would have done it if I hadn't have spoken to him*

6.10.1.2.1 How subjective norms may change over time

Many participants felt that as online services became more established over time, they would be considered a more 'normal' service for testing. Many participants anticipated that as online services become more 'normal', general levels of trust in the service will increase. They described how normalisation of the service occurred through personal experience of the service, peers' experience of the service or through recommendations from peers or sexual health professionals.

> *P026 (male/homosexual / white / aged 20-24 / did not return): … I think [online services will become more normal in time], yes, just because it is not … in our generation, growing up, it has just not been a thing, you have always gone to the clinic, and that is just what people say, 'I will just go to the clinic'. Not the clinic is coming to me! So yes.*

> *P011 (male / heterosexual / white / aged 25-30 / returned kit): Yeah definitely, as people use it you get more trust. It's when you're trialling something then that's when you have your guard up a bit more.*

One participant (aged 25-30, male heterosexual, black African) suggested that for some groups this may not change over time. He described how being seen attending a sexual health clinic formed part of the identity of a sub-culture of young black Caribbean males who lived on his estate. He referred to this subculture as 'rude boys', a term used to describe young males who subscribe to values and behaviours

described by Anderson's 'Code of the Street' that are often present in inner city areas of deprivation with higher levels of STI infection prevalence [249]. The participant described how testing for STIs in clinic services allows rude boys to define themselves by their sexual behaviours among the community. He went on to describe how the patience required to use an online service for STI testing did not align with the identity of a 'rude boy', as someone who has chosen to not pursue an education.

> *P023 (male / heterosexual / black African / aged 20-24 / did not order kit): Rude boy's- They have to [go to the clinic] [...] They test often so I think that's just ingrained in them… That's their walk of shame. It's not like the University walk of shame. That's their walk of shame. […] You're not really filling out the form online. No patience that's what it is. Like moving around all the time is like the way of life. Like not in education and stuff.…Yeah, you're not [messing] around with [the online service].*

6.10.1.3 Privacy

The importance of service confidentiality when testing was a prominent theme in interviews. Most participants expressed a preference to keep information about their STI testing activity concealed from members of their social circle and from members of the public. This was important because all participants described wanting to avoid stigma, judgement and any feelings of shame. They referred to the confidentiality that online services offered by comparing it to the confidentiality that clinic services offered.

Many participants referred to the increase in privacy that the online service offered over clinic services. Increases in privacy came from the avoidance of being seen by people they know or members of the public when entering a sexual health clinic or waiting in sexual health clinic waiting rooms and avoiding judgement from health care providers. Participants discussed the trade-off between gaining reassurance but experiencing stigma or judgement in clinic services and; going without this reassurance but avoiding any potential judgement from health care providers by using online services.

> *P003 (female / heterosexual l/ mixed black & white / aged 20-24 years / returned a kit): I think you get – online stuff is useful in that you get … all the information that you need you have links to everything you get texts to your phone but what you completely lack is the personal interaction and the individual like really specific advice… But then saying that you don't get the judgement that some people have felt you get, you don't get the waiting times and that personal interaction is not always positive umm but it's very useful.*

> *P019 (female / bisexual / mixed black & white / aged 20-24 / did not order): I think if you're online doing it, you're not facing another person so you're not going to see their reaction to your answer, or something, because going back to the same sex thing again, that could have been like your past that you don't want to identify to anymore, and if you're online saying that, that's absolutely fine, but if you have to say it to someone's face and you want to get rid of that past, it's not that nice coming out and saying it again.*

For some participants, while the use of an online service avoided the potential threats to posed by a clinic attendance, it posed alternative threats to privacy. Some participants described being concerned about breaches to social privacy caused by receiving a package that contained an STI testing kit at home. As discussed in the theme for trust, participants expressed concerns about the potential for medical, STI or sexual health related markings on the envelope as these could be seen by the person delivering the post, neighbours, housemates or family members. However, even without any markings on the envelope, young participants living with parents or relatives felt that their social domestic privacy could be breached just be receiving a package, because parents or relatives would be inquisitive about the contents of the package.

> *P015 (female / heterosexual / black African / aged 25-30 years / did not return kit): I thought it might say something like "STI Screen" or "Self Service for STIs" and stuff like that, so I was a bit concerned about that...*

> *P005 (heterosexual / white / female / aged 25-30 years / returned kit): I think, with people I work with its fine, because people get packages all the time, with my parents, um, definitely not now, but definitely when I was younger and living with them, if I got a package, for example if I was like, 14, 15, if I got a package, my mum would be like, what is that? What is it?*

There was also the potential for a breach of privacy when carrying out the sampling process at home. Participants that shared a home with someone who they did not want to disclose their testing to expressed concerns about someone coming into the room while they were sampling, or find leaflets, instructions or sampling equipment. Young participants described concerns about their parents discovering their testing activity through these means, while for older participants it was house mates or sexual partners.

> *P013 (male/homosexual / Asian / aged 20-25 years / did not return kit): People that don't feel that private at home [wouldn't want to do this test] – like if they have a shared bathroom and they worried about someone coming in when they do the test.*

6.10.1.3.1 Differences in the importance of privacy between groups

Who it was important to conceal testing from was different for participants from different demographic groups. Gender, age, sexual orientation and ethnic group were explicitly mentioned as factors that influenced the amount of stigma, shame or judgment a person may feel if someone knew they were testing. One young, male, black British participant described how females could feel more stigma around testing than males. Another male participant who was aged between 20 and 24 years and black African described how those under the age of 16 or attending sexual health clinics in school uniforms were particularly prone to stigma because of perceptions of UK laws dictating the age of consent at 16 years. An Arab male highlighted the influence of taboos around sex that exist within Asian or Arabic ethnicity or Islamic faith may have on perceptions of stigma or judgement around testing.

> *P008 (male / heterosexual / black British / aged 16-19 years / did not order kit): People would judge people that went to a clinic. They might start calling her a 'sket' or a 'slut'... people don't really talk about it… boys are more... girls... It's different for girls it can affect them more.*

P021 (male / heterosexual / black African / aged 20-24 / did not order kit): You'd be called like names, like really like derogatory names like slut or something like that because you're in your school uniform, you're in a sexual health clinic ... you shouldn't be having sex or doing sexual things, but the legal age for sex is 16.

P007 (male / heterosexual / Arab / 20-24 years / did not return kit): I think in terms of ethnicity …cultural influence is huge and like even Asian cultures and like I'm [Arabic] and I come from a Muslim family and sometimes you find that sexuality and having sex and testing is all kind of brushed to the side and hush hush and very taboo still.

This contrasts with what was previously described for 'rude boys', who one participant described as harnessing the judgement of others to re-enforce their social identify within the community. Additionally, among participants that perceived testing for STIs to be a positive behaviour there was less stigma and shame around testing. This was described by some homosexual men, a bisexual female participant and among participants aged over 25 years.

P019 (female / bisexual / mixed black & white / aged 20-24 / did not order): But I think it's your character as well, how you, if you're like quite blasé about it, like, "Oh, I don't care what you think," or whatever, then obviously that's fine, but obviously if you are either a shy person or you are that young, younger person it is a bit harder.

6.10.1.4 SELF-EFFICACY TO SELF-MANAGE

Many participants described how a users' self-efficacy to self-manage their sexual health influenced how they accessed STI testing services. Self-efficacy refers to confidence in one's ability to carry out a behaviour [250]. Participants referred to their self-efficacy to self-manage their sexual health in relation knowing when to access a service, ordering a test on the website, interpreting information produced by the online service and the process of self-sampling. While discussing self-efficacy, many participants described the influence of professional support from a health care provider.

6.10.1.4.1 Managing sexual health

A lack of self-efficacy to manage sexual health acted as a barrier to accessing online services for self-sampling at home. Two young black male participants described a lack of confidence in knowing when it is appropriate to test.

P012 (male / heterosexual / black British / aged 20-24 / did not return kit): I don't know anything about [STIs] - cos I don't think about it that's all [...] I don't know anything about that stuff …I had sex with a girl and the condom broke- she told me she was clean, but I don't trust her.

P008 (male / heterosexual / black British / aged 16-19 years / did not order kit): The doctor knows more about these things than I do [...] these infections.

Some interaction with a health care provider during testing was valued because a health care provider delivered information about risk of infection and potential treatment options, both of which provided reassurance. This became more important if a user was symptomatic. A symptomatic user may prefer to

attend a clinic setting because a health care provider could provide a diagnosis or rapid results. But even when asymptomatic, if perceived risk of infection was high, participants described the therapeutic benefits of talking to health care providers about their concerns and how this alleviated anxiety about infection.

> *P024 (male / homosexual / white / aged 25-30 / did not order kit): As I said, if I was to worry I would want to go to talk to somebody and explain what are the symptoms I have to get an immediate reassurance about what it could be or... Yeah.*

> *P021 (male / heterosexual / black African / aged 20-24 / did not order kit): If you go [to the clinic], because when I went that time, the nurse kind of reassured me, "yes, it is probably nothing, but we will test you anyway", so during that two weeks, even though I was quite concerned, I was playing in my mind he said it is probably nothing, so I probably don't have much to worry about.*

While some participants found a visit to a clinic for a test as a good opportunity to gain health promotion advice, one participant described this advice as un-wanted and un-needed.

> *P011 (male / heterosexual / white / aged 25-30 / returned kit): You're kind of responsible for your own sexual health, aren't you? Do you shouldn't really need someone to say silly boy or you've done something stupid….*

6.10.1.4.2 Use of the website and ordering a kit

Among many participants, self-efficacy for ordering a kit on the website was high. They found the information they needed to access readily available and easy to interpret.

> *P011 (male / heterosexual / white / aged 25-30 / returned kit): it's [the website is] pretty self-explanatory and easy really. And [the] material is really easy and clear.*

Conversely, two participants (both aged 16-25, male, black British, heterosexual) found the website took too much time and required too much thought, particularly after a long day. They described the website as 'long', suggesting it took a lot of effort, or was not worth the effort, particularly if perceived risk was low [251]. One participant highlighted the lack of opportunity to ask questions when using the site. A lack of patience for what was required to use the online service among young men was also identified by a female participant who worked in sexual health services.

> *P008 (male / heterosexual / black British / aged 16-19 years / did not order kit): The site looks long, especially when I don't think I have anything … you can't [ask] questions. It involves writing. I do enough writing in school. If I see it... and I can go on the site and I see it's not like writing I will do it… I need click options... it's long...*

> *P012 (male / heterosexual / black British / aged 20-24 / did not return kit): I didn't read the instructions, it was too much. Where do I start from like?.... I'd never do it no... [an online test like this]*

P015 (female / heterosexual / black African / aged 25-30 years / did not return kit): I think it'll be a 50:50 where you may get some [young men] that may take time out and read through it and actually go ahead with it and you'll get the others that will be like, "Okay this is just long, it's not for me" and just not do it or do it incorrectly.

6.10.1.4.3 Self-sampling

Self-efficacy to self-sample for STIs was also a prominent theme among participants. Some participants expressed high levels of self-efficacy to self-sample.

P022 (female / heterosexual / white / aged 20-24 / did not order): Yeah. I mean, this isn't really that much of a big deal, just putting a swab up, you know, you put tampons in all the time.

However, a lack of self-efficacy to carry out the sampling procedure correctly was a barrier to use of online services for many participants. Many participants described blood sample collection as the most daunting aspect of sample collection; describing feeling squeamish at the sight of blood and needle-phobia as barrier to access. Taking samples using swabs was also challenging. Participants suggested that additional support or information delivered via instructional videos, telephones or more detailed information could improve their confidence in self-sampling. One less confident participant suggested that being shown how to test by a health care provider would improve his confidence to use the online service.

P026 (male / homosexual / white / aged 20-24 / did not return): But then the squeamish thing, I am not sure, because I think for me, just the thought of doing it myself, I just wouldn't be able to do everything, I don't think.

P008 (male / heterosexual / black British / aged 16-19 years / did not order kit): I think it's ok to see a doctor or nurse first then go online…but first you should see a doctor or nurse then go out on your own.

6.10.1.4.4 The role of a health care provider

Most participants described how having a health care provider present for the sampling procedure gave users higher levels of trust in the validity of the results. Even when self-sampling within a clinic setting, doing so with the guidance of a health care provider diminished the level of user responsibility and increased users' trust in the validity of the results. Many participants also described a preference for continuity of management of care, from the sampling process through to treatment, by a team of healthcare professionals within a clinic setting. This was often described as more important when participants felt they were at a higher risk of a positive test result.

P024 (male / homosexual / white / aged 25-30 / did not order kit): I think in case I had some problem with something happening, going to a clinic and having somebody following you there would be maybe more consistent, I mean to be followed by the same team at least, if not the same doctor.

One participant discussed positive influence of judgement from health care providers. By treating a visit to the sexual health clinic as a reality check where he would have to disclose the sexual partners he had, he

became more self-aware of his sexual activity. He described how he relied on this to improve his own sexual health.

> *P017 (male / bisexual / white / aged 20-24 / did not order kit): I know that other people would bother – 'it's my own business and why are you asking me these questions?' But personally, I like telling you these things because if you're being a whore with 20 people then you need to realise that, and you do realise when someone asks you that question and you need to answer truly….*

Judgement from a health care provider also acted as a barrier to access of clinic services among some participants. One young female participant described how she visually assessed staff when attending a clinic as either judgemental or non-judgemental. If she felt the staff were judgemental, she would leave the clinic. Among homosexual male participants, perceived judgement from health care providers around disclosure of the number of sexual partners was a barrier to accessing clinic to testing. Because of this, MSM participants preferred to travel further to access testing in clinic settings which were described as 'gay friendly'.

> *P019 (female / bisexual / mixed black & white / aged 20-24 / did not order): but I walk into a place and the staff don't seem quite professional I would instantly walk out because you'd think, "Are they going to gossip about it later?*

> *P001 (transgender / homosexual / mixed any other ethnic group / aged 25-30 years / did not order a kit): I think it's with people who weren't used to dealing with gay men … they ask you questions about like how many people have you slept with in this time frame and you're just like $$$$ - I wish you would break those time frames up a bit, and some nurses would seem scandalised.*

6.10.1.4.5 Improving self-efficacy to self-manage

The online service empowered some participants by facilitating control over the timing of testing and improving their self-efficacy to self-manage health if they were able to carry out the process effectively first time. For participants that returned to the online service for another test, self-efficacy improved with the experience. Participants felt more comfortable with using the website, interpreting the information and carrying out the self-sampling after they had used the service at least once.

> *P023 (male / heterosexual / black African / aged 20-24 / did not order kit): Yeah, it's quite empowering it's like… Because you want to have control over these things like. Don't like to speak with people and worrying all the time right.*

> *P010 (male / homosexual / white / aged 25-30 / returned kit): I found it very stressful the first time I was doing it, you know checking I was doing it properly I think a lot of people testing for the first time at home or have the same problem I don't think they'll give up because you know that you're anxious that you'll get it right…. I took it home and I must say doing it second time round was much easier to do. I didn't follow any instructions because I knew how to do it. But the blood thing is not easy to do... that was hard.*

However, not all participants were willing to use the service a second time. Even among those that regularly test for STIs and considered themselves to have high levels of health confidence, there was a lack of confidence to interpret the sampling instructions. For those that attempted to follow instructions, but failed to interpret them correctly, the process became disempowering.

> *P025 (female / heterosexual / Asian / aged 25-30 / did not order): I was super embarrassed that I got something super simple with diagrams wrong…. I just got stuck on step two.*

6.10.1.5 CONVENIENCE

Participants discussed the convenience of the online service and contrasted it with how they felt about the convenience of attending clinic services. They described convenience as the ease of access to the service and referred to ease of completing of the test in both clinic and online services [104]. Convenience was influenced by a multitude of factors, including financial and opportunity costs, comfort, ease of use, time to test, concealing testing and access to additional services. Participants were aged between 16 and 30 years, and many were attending university therefore living and working circumstances were more changeable than an older population. Because of this, cost of use and concealment of testing were described as varying between testing episodes.

6.10.1.5.1 Cost of use

Participants described the convenience of a service referring to the potential 'costs' of testing using both online and clinic services. These costs were associated with deviations from a usual routine. In the context of testing, cost related to time in general, time away from work, cost of travel, waiting time in clinic services and potentially difficult conversations with co-workers or peers. For many participants, access to online services was described as more convenient than clinic access. They described the convenience of saving time by avoiding travel to clinic services, waiting in clinic waiting rooms and cost of travel. Use of online services meant participants avoided the need to take time out of a workday or other activity. By testing at a time that suited them, participants avoided potentially difficult conversations with co-workers about their absence from work while testing at a clinic.

Participants described how their distance from a clinic and the hours they are working or studying influenced how convenient attendance at a clinic was to them. They acknowledged the difficultly of attending a clinic for people working in a '9-5' job due to limited opening hours and long waiting times for 'walk ins' and extended waiting times for appointments. Although for those participants that had a clinic service near to where they lived, using online services was less convenient than clinic attendance, as it required more effort than a clinic attendance. Likewise, those with flexible working hours or a limited student timetable felt clinic attendance was convenient, therefore they did not see the need to use the online service.

> *P007 (male / heterosexual / Arab / 20-24 years / did not return kit): See here the thing is that because [the clinic is] so close to me it doesn't make any sense to order things online. It would actually inconvenience me to do that.*

P001 (transgender / homosexual / mixed any other ethnic group / aged 25-30 years / did not order a kit): I'm in a good position now because I'm sort of studying and then I'm doing odd jobs. So, I can kind of like fit going to the clinic relatively easily. But I get this when – whenever say I'm doing a normal human job like say a '9-5 job'.

6.10.1.5.2 Comfort and control

Additionally, participants described the convenience of taking a test in a comfortable environment such as their own home, and at a time which suited them. Online services also enabled more control over the timing of sampling for some. For one participant, online services enabled testing during the appropriate 'window period' for the infection which he was concerned about having.

P001 (transgender / homosexual / mixed any other ethnic group / aged 25-30 years / did not order a kit): And there have been times like where I've been a contact of a contact of like gonorrhoea where I've kind of been like… or the window period has been and gone and I haven't had any symptoms and I've had to kerfuffle with getting an appointment with dean street. I've been like but then you have no appointments available. There's no way I can take more time off work because I need the money. So in those types of situations I think this would be incredibly helpful actually.

For some participants, the additional convenience that online services offered over clinic services enabled users to test for STIs sooner, as they would have delayed testing had online services not been available.

P005 (female / heterosexual / white / aged 25-30 years / returned kit): Oh, I really need to get tested. But I think the problem, the reason I wasn't, or hadn't been compelled to, to do it sooner was the, because of the, having to take my own time out, having to sit in a clinic on Saturday morning, not knowing how long I was going to be there, like, just the whole uncomfortableness of it. And when I did see that advert, I thought, yeah, perfect opportunity, like, take that.

6.10.1.5.3 Ease of use

However, for many participants online services were not necessarily the most convenient testing option. Online services were only considered to be more convenient than clinic services if they were easy to use. Participants offset the potential increased convenience offered by online services against the potential inconvenience if the process of using online services was difficult. They referred to the level of difficulty or ease of the use of the website for ordering a kit, the sampling process and interpretation of the instructions as factors associated with an online service that could potentially be more difficult than attending a clinic service. A lack of health literacy showcased by difficultly or a lack of patience for following the process of the online service was highlighted as an issue for young men. Participants also referred to online services being less convenient amongst older people, implying that older people may have less digital literacy, finding newer technologies more difficult, or less enjoyable to use.

P024 (male / homosexual / white / aged 25-30 / did not order kit): [referring to online services] If I didn't have to physically go somewhere when I could do that at home and it's all really easy and self-explanatory, I wouldn't mind. Yeah, I would actually almost prefer, yeah

P007 (male / heterosexual / Arab / 20-24 years / did not return kit): [referring to online services] There's not travelling, there's not cost at all. For me it's way easier. But if you ask someone way older- they'll probably say [they prefer to go to] the clinic.

P012 (male / heterosexual / black British / aged 20-24 / did not return kit): I tried checking how to use it, but it was long... I didn't read the instructions, it was too much. Where do I start from like…? I've never do it no... (an online test)

6.10.1.5.4 Time to test

The time it took to obtain a testing kit was considered as a factor associated with convenience. Participants discussed urgency to test as a pivotal factor influencing their decision of whether to test online or in clinics. Participants described the inverse relationship between the importance of urgency and convenience. As testing for an STI was more urgent, the importance of the convenience a service offered diminished. Participants were willing to travel to clinics, take time off from work and endure long waits in clinic waiting rooms if they felt the need for testing was urgent. Urgency of testing was higher when perceived risk was higher. Taking a test quickly in a clinic relieved users' anxiety about a potential infection because users could discuss their risk of infection with clinic staff.

P006 (male /heterosexual / white / aged 25-30 / returned a kit): how quickly you can do [the test] the better. I mean even If you could pick up the test from a pharmacy umm either like do it at home or there in a cubical and then you can hand it back to the pharmacist- wait 10 minutes and find out that's the dream.

P015 (female / heterosexual / black African / aged 25-30 years / did not return kit): It [going online] would be too much of a wait and the anxiety as well, I just think it would be better for them to speak to someone and maybe they can get guidance from there as well about how to help them with their sexual activities and things like that.

6.10.1.5.5 Concealing testing

Participants referred to the inconvenience of online services for those wishing to conceal testing from those they lived with. The importance of this is described within the theme relating to privacy. The convenience of concealing testing is addressed here. Age was described as a factor influencing the need to conceal testing. Participants described how as people became older, it may become easier to receive the package without disclosure of the contents. Additionally, participants described that once a person had moved out of their parents' home, receiving a package at home became convenient. However, one participant highlighted that living with a partner from whom a person wanted to conceal use of testing services could also be a barrier to use of online services for self-sampling at home.

> *P005 (female / heterosexual / white / aged 25-30 years / returned kit): With my parents, um, definitely not now, but definitely when I was younger and living with them, if I got a package, for example if I was like, 14, 15, if I got a package, my mum would be like, what is that?... Whereas now, if she asked me what it was, she wouldn't think to ask me because I get stuff delivered there all the time….*

> *P007 (male / heterosexual / Arab / 20-24 years / did not return kit): I think if I was at home there would be no chance I'd have anything delivered to the house because if I get a package in my name and my mum sees that then there's no way I'm going to get away with it because she's going to demand that I tell her what it is.*

> *P005 (female / heterosexual / white / aged 25-30 years / returned kit): You know, there's no way you're going get something delivered to your house if you share with a partner. There's no way around that you're gonna have to get it at a clinic.*

6.10.1.5.6 Additional services

Additionally, some participants described clinics as more convenient than online services because they could access additional services. These included treatment, additional testing, emergency contraception, other forms of contraception or sexual health advice and promotion.

> *P019 (female / bisexual / mixed black & white / aged 20-24 / did not order): [If my friend had had unprotected sex] I would say go to the clinic because even though now I know you do the whole like HIV, chlamydia, gonorrhoea sort of list, but I would have said go straight to the clinic because I think you can get the morning after pill straightaway?*

6.10.1.6 PERCEIVED RISK OF INFECTION

All participants described how their perceived susceptibility to an infection influenced whether they would use any service for testing, and which service they would use. This included two elements, perceived likelihood of having an infection and perceived severity or type of infection.

6.10.1.6.1 Likelihood of having an infection

Participants discussed the influence that their perceived increased risk of STI would have on testing in general. Among all participants, perceived increased risk was increased by presence of symptoms, notification of sexual contact with someone who was positive, sexual intercourse with an individual they perceived to be more likely to have an infection, unprotected sexual intercourse and sexual behaviours considered to be riskier for contraction of infection. Participants described how individuals who perceived an increased risk of infection were more likely to test for STIs, as this acted as a trigger for testing. This was linked to higher levels of anxiety, fear and a preference for urgent testing. However, perceived increased risk could also result in avoidance of testing, as for some, they would rather have not known if they were infected.

> *P006 (male / heterosexual / white / aged 25-30 / returned a kit): But if it's something that's playing on your mind you need to get it sorted it's just like every day you start panicking and worrying about it.*

> *P012 (male / heterosexual / black British / aged 20-24 / did not return kit): If they really think there is a problem then they gonna do it [get tested... I'm scared of the result- what if I'm not clean. I don't want to know. Don't want no bad result. I don't want no bad text coming to my phone.*

Participants described how factors associated with convenience and privacy became less important when they perceived risk of infection to be high. They were less concerned about potential wait times in clinics, taking time off from work or being seen attending a clinic. Conversely, factors associated with the importance of a health care provider and trust in the service and the result became more important to participants as their perceived risk of infection increased. Attending a clinic for testing was preferred at these times because it gave users more control around getting tested and possibly treated faster, more reassurance, personalised information and a more reliable result.

> *P026 (male / homosexual / white / aged 20-24 / did not return): For ease of mind, I would rather just walk straight into a clinic, wait an hour or so and then just be seen by someone, and then have whatever the issue was sorted there and then. Because yes, sometimes you need instant access to drugs or something, and I don't think you would get that online...*

> *P016 (female /heterosexual/ black Caribbean/aged 20-24/ did not return kit): [the online service] would take a while to come and I would want to get the ball rolling as soon as possible. So, if it meant me going to a clinic, I would go. If not, I would go to a pharmacy and get one of their chlamydia tests.*

In situations where users perceived their risk of infection to be low, such as during routine testing, online services were an appropriate option. Because online services are more convenient for many people, they may be more inclined to test for STIs, when they wouldn't normally access a clinic. Conversely, if someone considered themselves to be very low risk, they may lack the motivation to take the sample and return the kit using the online service. Perceived need for testing was highly changeable between testing episodes.

P006 (male / heterosexual / white /aged 25-30 / returned a kit): [my housemate] is not a – I'm not sure he's actually ever been to a clinic before. It's not like he had any symptoms or any reasons or thing that he needed to do it… I don't think he would actively go to a clinic because he doesn't feel it's a necessity- doesn't have to so he doesn't feel like he has to put himself through that awkward ordeal whereas here the online things I can do it all from the comfort of my own home and letterbox- yeah and I think that was the first time he's actually ever done any sort of sexual testing.

P024 (male / homosexual / white / aged 25-30 / did not order kit): This [the online service] I could see as a routine thing to do if I don't have any naughty thoughts. (Laughs) I mean, if I think I'm fine I think this is brilliant. If then I would start worrying about something, I think I would probably go to a clinic.

P022 (female / heterosexual / white / aged 20-24 / did not order): Only because I knew I didn't have anything and I was like, "I'm not really going to [take a blood sample] just for this".

P023 (male / heterosexual / black African / aged 20-24 / did not order kit): Yeah, I think like invariably people make it work don't they. Like if I got a text from someone saying like bam, I've got this you need to go get tested or like so it's an urgent thing. Like I don't really mess about with it. Like I had a couple of situations where like girls have said like I have got something. So yeah, I treat that with… I've left work to go and get tested before. So, like the last time it happened to me like, I was at work and I went. So, time is not really… I would wait for four hours.

6.10.1.6.2 Type of infection

Participants also described how the type of infection that someone perceived themselves to be at risk of influenced their choice of where they tested. This was a prominent theme among all participants. Participants considered the consequences of HIV to be more serious than other STIs, therefore participants described how a perceived risk of HIV would result in different testing behaviour. This included a fear of the physical consequences of HIV infection and perceived societal stigma for HIV infection. If a participant had a perceived risk of HIV, clinic attendance was preferable to testing online because clinic services could offer additional reassurances that would reduce anxiety, they could offer guidance and sexual health promotion, faster and more reliable results. Participants stressed the importance of obtaining a correct test result for a HIV test. By contrast, participants considered online services to be appropriate when users perceived themselves to be at risk of chlamydia infection because chlamydia infection was treatable and less severe than other infections.

P005 (female / heterosexual / white / aged 25-30 years / returned kit): For me, HIV is a… different one because it's so, um, scary. But then again at the same time, if you're worried about it, you just want to know.

P019 (female / bisexual / mixed black & white / aged 20-24 / did not order): And something really, really serious like [HIV], I would want 100% correct method of doing it kind of thing, even though this is very straightforward, but I don't know, I just think you want a professional kind of to do it with you.

DISCUSSION

6.11 Main Findings

This chapter explored the barriers and facilitators to use of online services for self-sampling at home and identified the key themes among these. Through this process it identified the barriers and facilitators to use of online services for STI self-sampling at home. Six key themes among these factors have been identified for the development of scales to measure these themes among service users quantitatively. These six themes are trust in services, subjective norms, privacy, self-efficacy, convenience and perceived risk of infection.

Within each of these themes, participants described how the characteristics of the individual interact with the context to influence access. To use the analogy of a two-sided coin, the theme represents the coin, one side of the coin represents the characteristics of the individual and the other side of the coin represents the characteristic of the service. For example, when describing trust, users described how the NHS branding (service characteristic) influenced their perceived level of trust in the service (individual characteristic). By presenting the data in this way, the implications that changes to service characteristics (such as branding) will have on the individual factors influencing access (such as trust) remains clear.

6.12 Viewing the findings in relation to Andersen's Model of Access to Medical Care

Figure 6.1 places the findings from this study within Andersen's framework. Andersen's framework describes the three major components of both individual and contextual factors as those that predispose use of services, those that enable use of service and those that are associated with need for services [167] (Figure 2.1). Predisposing conditions are not directly responsible for use. They are related to a person's ability to cope with the presenting problem and command resources to deal with the problem or their attitudes, values and knowledge of health services [104, 167]. Enabling conditions are those that facilitate or impede use of services [167]. These reflect one's ability to use the service and what the personal costs of using the service are including travel time, time off or work or waiting time [104, 167]. The third component of Andersen's model relates to need or conditions that laypeople or health care providers recognise as requiring medical treatment [167].

Within the data collected in this study, the themes for trust, subjective norms and privacy reflect predisposing factors. The influence of predisposing demographic factors including age, gender, ethnic group and sexual orientation was also discussed within these themes. Trust predisposes use of services because it relates to users' attitudes, values and knowledge of health services [252]. Participants referred to the influence of both trust in online services and trust in face-to-face services on the outcome of online service use. They described how the characteristics of the service such as service reliability and the health information provided interacted with an individuals' characteristics to determine the level of trust an individual had in online services. Subjective norms predispose use because they relate to what important others think someone should do and are therefore related to values around service use [144, 253]. An individuals' subjective norms were influenced by societal or social normative beliefs about testing online. Attitudes about the privacy of sexual health service use reflect a person's attitudes and values around

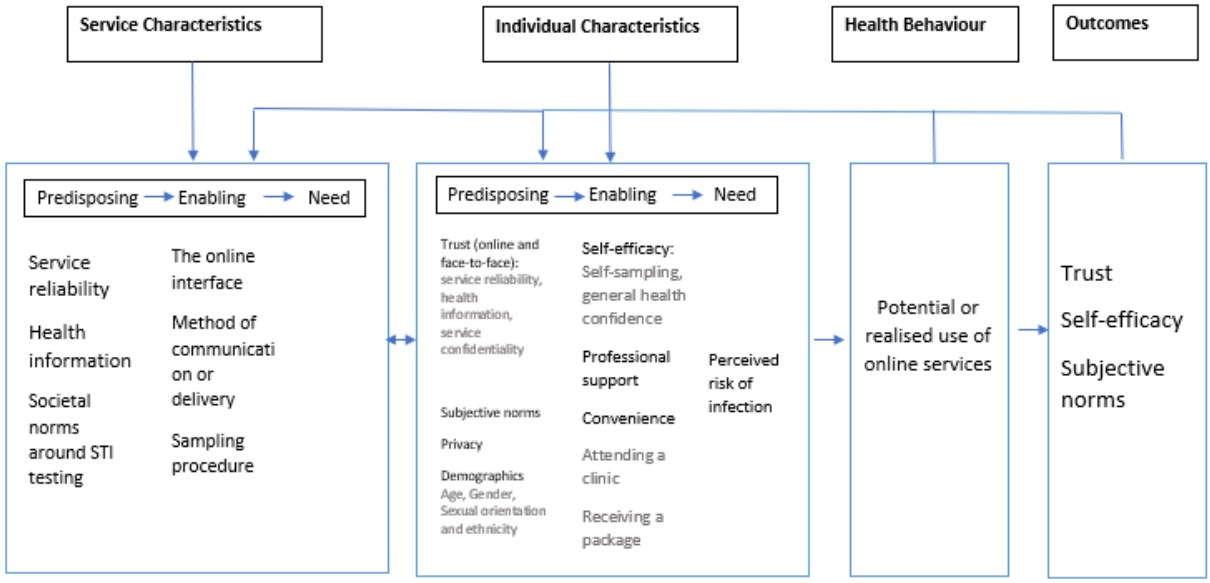
sexual health and their belief in the service's ability to manage their data confidentially [254]. These therefore also reflected predisposing characteristics. Within the themes for privacy, convenience and self-efficacy, the influence of demographic characteristics was discussed. These have been included as predisposing characteristics.

The themes describing self-efficacy and convenience describe enabling factors. The theme for self-efficacy relates to individual's self-belief in their ability to use the online service and includes the role that professional support plays in this process [250]. Participants described how an individuals' self-efficacy, interacted with the characteristics of the services, such as the web interface and the type of sampling required influenced. Convenience describes personal costs of using the service and therefore reflects an enabling characteristic. Within this theme, participants described how some aspects of convenience were highly related to their circumstances at the time. For example, the personal cost of using a service depended on working or study arrangements. Additionally, concealing testing from others was dependent on one's living circumstances at the time of the test. Because interviewees were relatively young (aged between 18 and 30 years), where they lived, worked or studied was relatively changeable year to year. Therefore, how easy or difficult it was to attend a clinic or conceal home-based testing could change between each testing episode.

Perceived risk of infection reflects need for services in terms of felt need. Within the data participants described how perceived need for testing was most proximal to use of services and acted as a trigger for use of testing services. Perceived risk was related to an individuals' assessment of their own sexual behaviours, the sexual behaviours of their sexual partner, their own symptoms or notification of a partners' infection. Therefore, for the same individual perceived risk could differ between each episode of testing.

The data in these interviews also reflect some of the feedback loops present within Andersen's model. Participants explicitly describe how carrying out self-sampling (health behaviour) influences subsequent trust and self-efficacy. Specifically, participants described how self-efficacy would improve if they were able to successfully use the online service to test for STIs. They also described how trust in a service would improve with a positive experience of using the service. Finally, societal norms would improve as the service becomes more established. These are important factors when exploring access to a new, novel service intervention because they indicate change over time.

Figure 6.1: Placing the study findings within Andersen's Model for Access to Medical Care



Grey text indicates a sub-theme, black text indicates a major theme

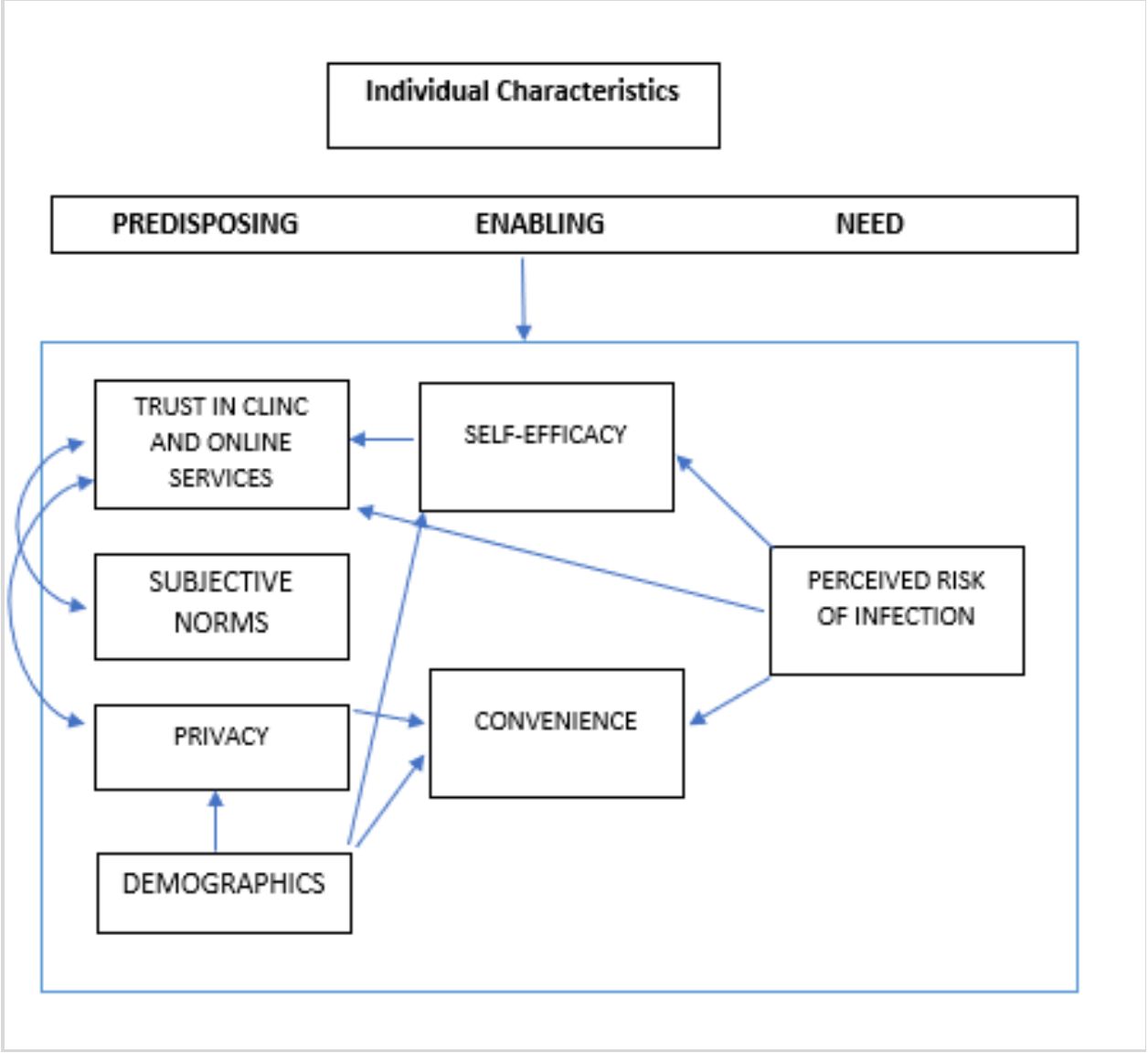
However, the data collected in these interviews did not perfectly fit into the Andersen model. The differentiation between themes were, at times, blurred by interactions between factors. Figure 6.2 describes the interactions between individual factors that were identified within interviews. Trust in the confidentiality a service would provide was influenced by respondent's feelings about the importance of privacy. These two factors then interacted with convenience to determine how convenient or inconvenient a service was in terms of concealing testing. Trust in the accuracy of a self-test was influenced by self-efficacy and perceived risk of infection. Trust in the reliability of online services was also influenced by the subjective norms and perceived risk. Demographic factors (age, gender, sexual orientation and ethnic group) interacted with privacy, self-efficacy and convenience. Perceived risk of infection influenced self-efficacy and convenience. The complexity of the interactions between individual factors is not reflected within the Andersen model for access to medical care (Figure 2.1) [167].

Andersen's model indicates that factors associated with need are most proximal to use of services, while enabling and predisposing factors are more distal to use of services [97]. Evidence from these interviews suggests that while need is proximal to use, the enabling factors for the difficulty of attending a clinic at the time of testing and the difficulty of receiving a package in the post at the time of testing were also described as proximal to use of online services. Participants described how these factors were considered when choosing which service to use. The proximity of these convenience factors to type of service used seen in this study is likely to reflect the fact that this study uses the Andersen model to describe the type of service used for testing for STIs, rather than the decision to test for STIs.

Finally, the Andersen model describes the influence of contextual characteristics on individual characteristics for service use. In this study, rather than this being one-way, service characteristic (contextual) and individual characteristics interacted to result in type of service used for testing. This was reflected in the way participants discussed both individual and service-related barriers and facilitators to

use of services interchangeably. To reflect this, a two-sided arrow has been included between contextual and individual characteristics (Figure 6.1).

Figure 6.2: Relationships Between Individual Factors Relating to Access to Online Services for STI Testing



6.13 Findings in relation to other studies

The theme for trust that was identified in this chapter related to both trust in online services and trust in face-to-face services. Higher levels of trust in online services and higher levels of trust in face-to-face services were described to have a positive influence on use of online services. Participants described how users that lacked trust in existing services were less likely to trust a new, novel online service. The importance of trust in access to services is well documented throughout the literature relating to access to services [155, 248, 255]. Generally, a lack of patient trust in institutions is associated with reduced utilisation of health care, reduced adherence to recommendations and poor self-rated health [252, 256]. Trust is one way of managing the risk that is generated by a lack of knowledge and uncertainty [257] and is a necessary

aspect of access to healthcare [248, 255]. It becomes particularly important when health services are new given the higher levels of uncertainty involved [255].

In this chapter, participants reported the influence of perceived risk of infection on access to online services. Participants reported that higher levels of perceived risk of infection, or a perceived risk of HIV acted as a barrier to use of online services. Participants also reported that perceived risk was most proximal to a users' choice of service for testing, suggesting that higher levels of perceived risk resulted in heightened concerns about trust in the result and self-efficacy and less concern about privacy and convenience. Finally, participants highlighted that perceived risk was subject to variation between testing episodes because perceived risk was associated with the type of sex they had recently engaged in, or their perception of risk in the person they had recently had sex with.

Previous studies in London, the west-midlands and Scotland have explored factors predicting use of similar STI testing and self-sampling in the UK. A study investigating young people's perceptions of smartphone enabled self-testing and online care in London described a general enthusiasm for the service and perceived high levels of convenience [170]. Similar to the results from this chapter, participants described privacy concerns around testing at home using the new service, the benefits of avoiding judgement, the importance of concealing use of services and a tension between a preference for avoiding a clinic and the desire to receive support from a professional [170]. However, participants were referring to a prospective service, rather than an actual service therefore they may not have identified some of the practical barriers and facilitators to use of services. A qualitative study of university students in the West-Midlands investigated perceptions of self-testing for chlamydia, both at home and in clinics [149]. Like the results from this chapter, this study also identified perceived convenience, privacy, concerns about test accuracy and a desire for support from a professional as important factors in access to the service [149]. The West-Midlands study explored participants anticipated responses to positive test results in the absence of a health care provider in more detail than this chapter does [149]. In Scotland, a qualitative study of young men living in urban and semi-rural areas investigating the barriers and facilitators to internet-based chlamydia screening also identified privacy concerns about STI testing among young men who live with their parents [172]. However, all three studies investigated use of a service that had not yet been established among prospective users [149, 170, 172].

6.14 Strengths and limitations

This study has many strengths. This is the first qualitative study to explore the barriers and facilitators to use of online services for STI self-sampling among a population who had been asked to use the service and had knowledge of a specific service that they could refer to during the interviews. The interviewer was explicit about her independence from any service provider allowing participants to share their views on the services openly and reducing the social desirability response bias [258]. The study used an established analysis technique to identify and describe key themes and their domains, then place them within an existing framework. This technique is appropriate for exploratory work. However, it does have some limitations. By developing the framework a priori, it may have influenced inductive generation of coding. Although establish methods were used, formal methods of validity checks through second coding were not

recorded. However, the lack of formal recording of this process is unlikely to influence the validity of the coding. The population interviewed participated in an RCT and are therefore subject to inclusion criteria, which narrowed the population who were accessible. They are also more likely to be socially mobile, having agreed to take part in a trial [259]. Therefore, the breadth of themes identified in this study could be more limited than those within the general population. One obvious limitation is the lack of young people interviewed who were aged between 16 and 19 years. This group was particularly difficult to recruit because many of their number of phone numbers were no longer connected. However, many participants reflected on their own experiences as a younger person, therefore these themes were identified through older groups.

6.15 Rationale for Further Research

The findings from this study identify the barriers and facilitators to use of online services for STI self-sampling at home among six key themes. These factors may be the underlying reasons behind differential access between groups that is evident in the findings of Chapter 5. The aim of this thesis is to investigate equity of access to online services for STI self-sampling at home. Access to services is deemed fair or equitable if need-based criteria are the main determinants of access [113]. Therefore, to investigate equity of access to online services, further studies should explore which of these factors explain most of the variance in access.

Chapter 7 DEVELOPING A TOOL TO MEASURE THE FACTORS THAT INFLUENCE ACCESS TO ONLINE SERVICES FOR STI SELF-SAMPLING AT HOME

INTRODUCTION

Chapter 6 identified six key themes for the barriers and facilitators to use of online services through qualitative interviews. These include trust, subjective norms, self-efficacy to self-manage, privacy, convenience and perceived risk of infection. Because many of these themes represent theoretical phenomena that are not readily observable by direct means, this chapter develops a measurement instrument to reveal these theoretical themes. Chapter 8 goes on to establish the psychometric properties of the measurement instrument developed in this current chapter.

BACKGROUND

Chapter 6 identified the barriers and facilitators to accessing online services among six key themes. One way to measure the extent to which each of these factors influences access is to quantify the variation in access attributable to each of them. By quantifying the variation in access caused by these factors, value judgments can be made around whether factors associated with need are the main cause of the variation [97]. In addition, by understanding which of these factors influence access the most, service designers can focus their efforts on those factors with the largest effect to adapt services to improve access. This approach to the evaluation of access is used in combination with Andersen's framework for access to health services [260-262].

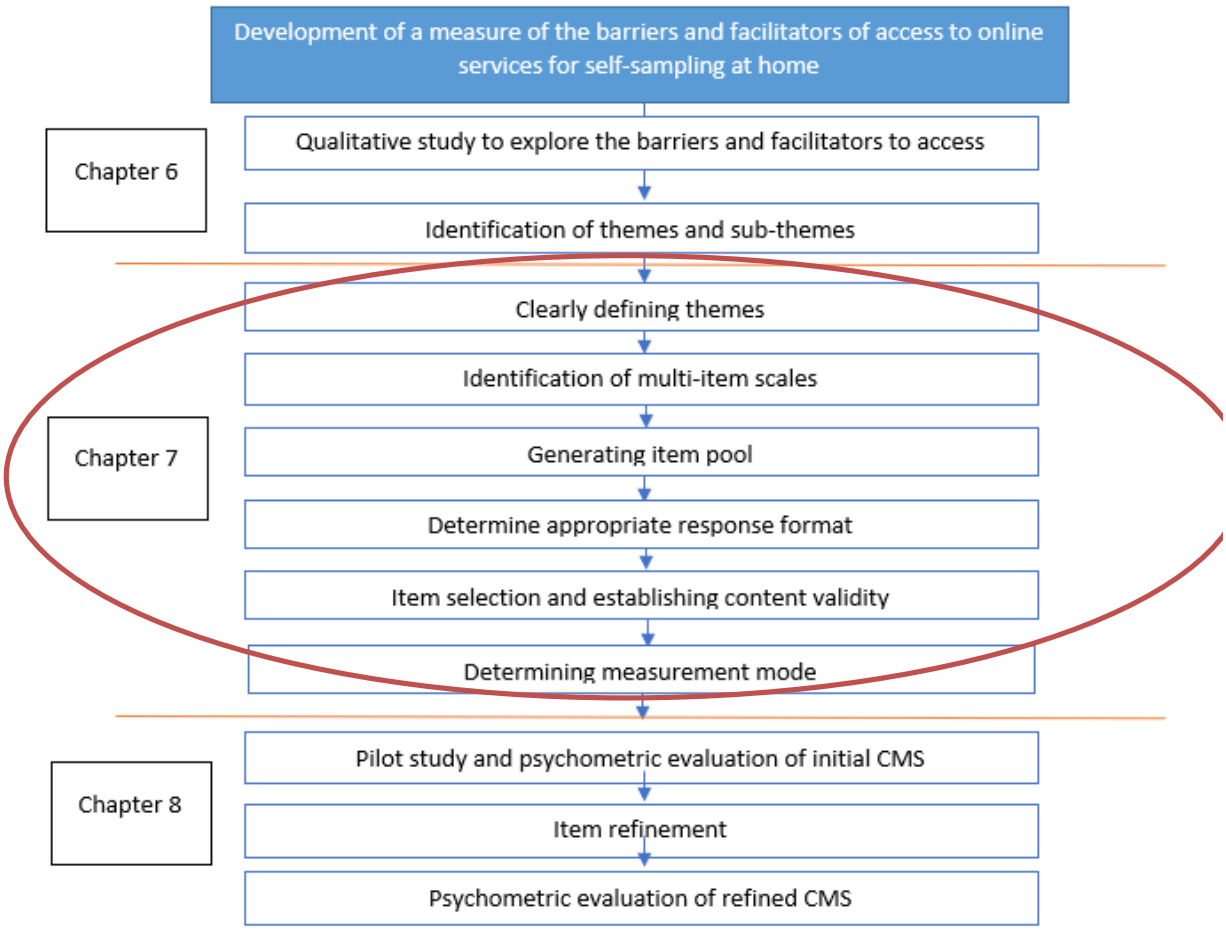
Many of the themes identified in Chapter 6 represent theoretical phenomena that are not readily observable by direct means. For example, trust is a theoretical phenomenon that is not directly observable. To reveal these theoretical themes quantitatively, a measurement instrument is required [263]. Measurement tools are collection of items (often survey questions), that when combined reveal levels of theoretical variables not readily observed by direct means [263]. These collections of items are often referred to as scales.

Measurement instruments are now used throughout health services research to measure different aspects of access to health services and patient outcomes. The Patient Activation Measure (PAM) is one example of a well-established measurement instrument that is used by the NHS to understand patient's level of knowledge skills and confidence to manage their own long-term health conditions [264]. In relation to access to online services for STI self-sampling, one study developed a series of short scales to predicted intention to self-sample for chlamydia in the UK [150]. The study used theoretical constructs from the Theory of Planned Behaviour (TPB), the Protection Motivation Theory (PMT) to develop short scales, however it does not cover the breath of themes identified in Chapter 6 [150]. In addition, only one measure of the reliability of the scales is presented [150]. At the time of writing, there is no measurement instrument for the factors, including access to online services for STI self-sampling at home, that has been validated for use in the UK.

This chapter develops a measurement instrument for the barriers and facilitators of access to online services for STI self-sampling at home. Because measurement instruments quantify abstract theoretical constructs, the process of developing an instrument focuses on reducing error in the measurement process [263, 265]. The following two chapters describe this process. For the purpose of this thesis, I will refer to the entire measurement instrument that is developed as the composite measurement scale (CMS) and groups of items that are developed to measure each theoretical construct as scales. I will refer to the theoretical constructs as themes, and major dimensions within the theme as sub-themes. This chapter describes the development of the CMS, and the scales and items within it. Chapter 8 will then go on to establish the psychometric properties of the scales developed in this current chapter.

PROCESS OVERVIEW

Figure 7.1: Process overview of the development of the composite measurement scale



AIM

To develop an initial composite measurement scale (CMS) for the barriers and facilitators of access to of online services for STI self-sampling at home.

METHODS

This phase of instrument development follows established guidelines for scale development [263]. It includes the following stages: defining themes; identification of appropriate themes for multi-item scales; generating an item pool; determining an appropriate response format; selecting items from the pool; establishing content validity and determining an appropriate measurement mode. Each stage follows established methods where possible to improve content validity of the scales [263]. However, because the CMS development was not the primary focus of the thesis, the time and expertise required to implement some more complex methods such as complex item selection techniques and cognitive testing was not available. The methods used in each stage of the development are detailed below.

A panel of researchers was assembled to discuss each stage of CMS development. The panel consisted of two experts in the field of STI testing and sexual health (context) and one expert in psychometrics (methods). More details about the panel members can be found in Appendix O.

7.1 DEFININING THEMES

Themes were defined to ensure the scales that measure them remained grounded in the data from which they were sourced. Definitions of key themes were then corroborated with definitions of themes within existing literature where possible. For themes that related to more general theoretical constructs such as trust or privacy, corroboration with the literature was possible. For themes that related specifically to STI self-sampling, such as convenience corroboration was not possible.

Sub-themes that had been identified within qualitative interviews were utilised. For the theme relating to privacy, where no clear sub-themes were defined in interviews, the panel discussed the underlying themes relating to privacy. These were then corroborated with existing literature. Existing literature included any literature obtained within the scoping review and any further external literature gained through additional searches directly related to these themes.

The panel also discussed whether themes and sub-themes should be measured with one scale or whether they required more than one scale. Candidate themes for multiple scales were those that contained distinct sub-themes, or those that related to both online and clinic services and therefore needed separate scales for each type of service. This was discussed by drawing from data from the qualitative interviews.

7.2 IDENTIFYING CANDIDATE THEMES AND SUB-THEMES FOR SHORT MULTI-ITEM SCALES

The number of items used to measure a theme was dependent on how tangible or ambiguous the theme was. Tangible themes were those that were relatively concrete and would not require high levels of evaluation or interpretation for a respondent to illustrate their position within that theme [263, 266, 267]. Ambiguous themes were those that would require a respondent to reconstruct, interpret, judge, or evaluate

less accessible information to illustrate their position within that theme [263, 266, 267]. More ambiguous themes, such as trust, are social constructs that are made of up a combination of factors that require the respondent to interpret, or judge information to effectively capture the construct [266, 267]. In this case a multi-item scale was used to capture the essence of the variable with a degree of precision [263, 266-268]. Conversely, themes that relate to relatively unambiguous characteristics such as age, or those tied to a single event, such as an STI testing episode are typically more concrete constructs [263]. In these cases, a respondent may find information about these constructs easy to access and therefore could accurately respond to a single item to measure these themes.

The panel reviewed the theme or sub-theme in relation to the data collected in Chapter 6 as well as existing literature and rated the tangibility as low, medium or high. Themes or domains that were rated as low or medium tangibility were assigned short (maximum of 10 items) multi-item scales. Highly tangible items were considered appropriate for single items. Multi-item scales were constrained to a maximum of 10 items to ensure that the development, testing and delivery of the survey was feasible within the time constraints of the PhD.

7.3 IDENTIFYING THE VARIABILITY OF THEMES

How likely it was that a person's measure of a theme would change between testing episodes was discussed. The discussion drew from data from qualitative interviews. The panel also discussed the plausibility of the variation. The variability was rated as high if the theme was subject to high levels of variation between testing episodes, medium if there was likely to be some change over time and low if the theme was not likely to vary over time. For themes with high levels of variation, items were developed with the aim of asking them in relation to specific testing episodes.

7.4 GENERATING AN ITEM POOL

7.4.1.1 IDENTIFICATION OF EXISTING SCALES

To avoid replication of development of scales, searches for appropriate existing scales were carried out. Literature searches were used to identify existing scales which could be used or adapted to the context to measure domains or sub-domains of themes. The search strategy involved searching major literature databases including PubMed, Web of Science and Google Scholar using the theme name and its synonyms and the domain and its synonyms combined with synonyms for measurement tool.

In addition to literature searches, hand searches of known repositories of access to health care and sexual measures were carried out. These repositories included The Handbook of Sexuality Related Measures [269, 270], John Hopkins Centre for Health Disparities Solutions Projects [271] and The Institute for Collaboration on Health, Intervention, and Policy (InCHIP)[272]. The pool of survey items generated from this process is available in Appendix P.

7.4.1.2 ITEM GENERATION AND SCALE DEVELOPMENT

For sub-themes where there were no appropriate existing scales available, items were developed. Short multi-item scales were developed for themes that were not directly observable and those that were multidimensional in order to improve scale reliability [268]. For each item, an item pool of approximately three to four items reflecting the underlying sub-theme was developed with the intention of developing an

item pool that was three to four times the size of the anticipated final scale [263]. To ensure items were culturally appropriate the language within items drew on language used within interviews.

7.5 ITEM SELECTION

Once the item pool was established, SB selected candidate items to represent themes. The panel of experts was then brought together to review the selected items (Appendix O). Panel members discussed candidate items for selection on the basis of establishing content validity. Although this is presented as a linear procedure, analysis was an iterative and reflexive process. Content validity was established by assessing the representativeness, comprehensiveness and clarity or items and scales.

7.5.1.1 CONTENT VALIDITY

Content validity refers to the extent to which the items in a scale measure all the facets of the given construct [270, 273]. It is established if the scale items are related to the defined construct, and the items do not measure other closely related concepts. For the development of the CMS content validity is evaluated at two stages. In this chapter, the representativeness, comprehensiveness and clarity of the scale are assessed by the panel of experts during item selection [274]. In Chapter 8, construct validity is evaluated using factor analysis.

7.5.1.1.1 REPRESENTATIVENESS AND COMPREHENSIVENESS

The panel viewed the pool of items and discussed the following:

- For each theme or sub-theme, whether the selected items were representative
- Whether the theme was fully represented by the items and whether further items needed to be generated
- Whether the entire CMS represented all of the themes identified in interviews [263, 275].

7.5.1.1.2 CLARITY

The clarity of each item was discussed in relation to ambiguity. Ambiguous items were those that could be interpreted in more than one way. Particular attention was paid to newly developed items. Items that were ambiguous were refined. Items were then read and checked to ensure they did not include double barrelled items, ambiguous pronouns and adjective forms instead of noun forms. Both positively and negatively worded items were included.

7.6 SURVEY DESIGN AND IMPLEMENTATION MODE

Items were tested with 10 peers to determine the degree of interviewer involvement required for interpretation of survey items. Comprehension of items, ability to recall items and appropriateness of items [276] was discussed with peers, however no formal model of cognitive testing was employed. Peers were colleagues and students at King's College London who were representative of the age of the target population and were familiar with the local context. Feedback was elicited from each test participant via a post survey debrief.

7.7 RESPONSE FORMAT

The response format for each item was selected based on ease of interpretation and mode of delivery of the survey items. Response formats were refined after a discussion by the panel following feedback from the small test of the survey on 10 peers.

RESULTS

7.8 DEFINITION OF THEMES

The six key themes and their sub-themes are defined in Table 7-1. The themes and sub-themes have been drawn from the data elicited through qualitative interviews. Where themes have been corroborated, references have been included (Table 7-1).

For the purpose of scale development some themes are presented in Table 7-1 with additional subthemes to those that were presented in Table 6-3: Subjective norms and personal identity includes an explicit subtheme for influence from peers; self-efficacy to self-manage includes an explicit subtheme for self-efficacy; Privacy is expanded to represent stigma, shame and judgement; The subtheme for professional support is expanded to include subthemes specific to professional support; and convenience includes a subtheme for convenience of access at the time of testing. The subtheme of judgement appears within two themes, professional support and privacy to capture both adverse social judgement from attending a clinic and adverse social judgement from a health care provider.

Table 7-1: Theme and sub-theme definitions and relationship to existing theory

Theme/sub-theme	Definitions
Overarching Theme: Trust	
Trust	A way to manage the uncertainty around the expectation that testing is carried out in a way that is both accurate and confidential [248]. Trust in online and trust in clinic services were both relevant.
Subthemes	
Service reliability	Service reliability related to the process of testing, which included; sample labelling; sample delivery; notification of results and accuracy of results.
Trust in health information	This included information about risk of infection and prevention of future infections.
Service confidentiality	Confidentiality related to data protection and, for the online service, whether the online service would deliver a testing package discretely.
Overarching Theme: Subjective Norms and personal identity	
Subjective norms	Subjective norms are perceived social pressures to engage or to not engage in a behaviour [27].
Subthemes	
Influence from peers	How peers felt about the service.

Personal identity	Whether use of the service was appropriate for one's personal identity (goals, values and beliefs specifically in areas around sexual health and gender role identity).
Overarching Theme: Self-efficacy to self-manage	
Subthemes	
Managing sexual health	Confidence in one's ability to manage the process of STI testing and interpret the information provided.
Self-efficacy	Confidence in one's ability to self-manage their sexual health, including ordering and self-sampling [29].
Use of the website and ordering a kit	Confidence in one's ability to use the website.
Self-sampling for STIs	Confidence in one's ability to self-sample.
Professional support	The influence of face-to-face professional support during the process of testing and self-sampling. It captures the preference for support, which is closely linked to self-efficacy.
Subthemes within professional support	
Validity of results	The influence of professional support on perceived validity of results.
Personalised information	How personalised information influenced perceived risk and feelings of reassurance.
Sexual health promotion	The perceived importance of health promotion opportunities during face to face consultations.
Judgement	The perception of judgement from health care providers during face to face consultations [277]. Feelings about adverse social judgement following disclosure of sexual behaviours or testing [277].
Overarching Theme: Privacy	
Privacy	A preference to keep information about STI testing activity concealed from members of their social circle and members of the public so to avoid stigma, judgement and subsequent feelings of shame.
Subthemes	
Stigma	An attribute or label that sets a person apart from others and links the labelled person to undesirable characteristics [278].
Judgement	Feelings about adverse social judgement following disclosure of sexual behaviours or testing [277].
Shame	Shame relates to the negative emotion one feels when they experience failure in relation to personal or social standards, which in this context relate to sexual

	health or practices. Shame can be an internalized reaction to stigma or judgement [278].
Overarching theme: Convenience	
Convenience	Convenience as the ease of access to the service.
Subthemes	
Cost of use	Cost related to time in general, time away from work, cost of travel, waiting time in clinic services and potentially difficult conversations with co-workers or peers.
Comfort	Physical comfort during testing.
Control	Ability to control the timing of testing based on window periods for detecting infection.
Ease of use	Perceived ease of use of website and testing kit (online only).
Time to test	How quickly one could obtain a test.
Concealing testing	Ease of concealing testing.
Additional services	Ability to obtain additional services.
Access at time of testing	How easy or difficult it was to access a clinic or receive a package in the post at the time of the test.
Overarching theme:	
Perceived risk of infection	Perceived susceptibility to an infection at the time of seeking a test.
Subthemes	
Perceived likelihood of having an infection	Perceived likelihood of having any sexually transmitted infection.
Perceived severity /type of infection	Perceived likelihood of having a sexually transmitted infection considered as severe.

7.9 IDENTIFYING THE NUMBER OF SCALES REQUIRED

The panel was assembled to discuss each theme. They discussed the themes' tangibility and identified potential themes for multi-item scales. They also discussed themes in terms of whether more than one scale was required to measure different aspects of the theme. Finally, they discussed whether the theme related to something that was highly variable between testing episodes, and therefore needed to be asked in relation to a specific testing episode. Each theme was discussed, drawing on the data from qualitative interviews. The results of this are presented in Table 7-2.

7.9.1.1 TRUST

The theme for trust specifically related to aspects of the both the online service and the clinic services. Because online and clinic services differ in terms of the service context, the aspect of the service which users may consider trustworthy or untrustworthy may differ between the two services. Therefore, two scales were deemed appropriate; one for trust in online services and one for trust in clinic services. Interviews suggested that trust would change slowly over time, rather than change between testing episodes. It was therefore deemed appropriate to measure users' general level of trust in services. Trust was considered as moderately tangible therefore was deemed a candidate for a multi-item scale.

7.9.1.2 SUBJECTIVE NORMS

The theme for subjective norms consisted of general factors relating the influence from peers, and those relating to personal identity. These two aspects of subjective norms corroborated with existing literature based on a psychological model of behaviour change called The Theory of Planned Behaviour (TPB) [143]. Literature supported the measurement of both of these aspects within the same domain [143]. Like trust, interviews suggested that subjective norms would change slowly over time. It was therefore deemed appropriate that subjective norms were measured generally, rather than in relation to specific testing episodes. Subjective norms were considered to have a low tangibility therefore a multi-item scale was deemed appropriate for their measurement.

7.9.1.3 SELF-EFFICACY

In interviews, participants described their self-efficacy in sexual health, referring to self-efficacy in general self-management as well as self-efficacy to perform tasks associated with online services. Self-efficacy in self-management is a general theme that is prominent within existing literature [279], while self-efficacy to self-sample at home was specific to the context of online services for self-sampling at home. Participants also discussed the role of face-to-face professional support throughout the testing process. This is specific to the context of self-sampling for STIs at home. It captures how someone values the presence of a health care provider during the self-sampling process. Three scales were deemed appropriate to address these three aspects of self-efficacy to self-manage. The first relates to health confidence, the second relates to self-efficacy to self-sample and the third relates to preferences for professional support. These were all considered to have medium or low levels of tangibility therefore required multi-item scales.

In interviews participants described that preferences for professional support and health confidence may change slowly over time. It was deemed appropriate to measure health confidence and preferences for professional support generally, rather than in relation to specific testing episodes. In interviews participants described how self-efficacy to self-sample could improve quickly if they successfully self-sampled at home. This sub-theme therefore could vary with each testing episode. It was highlighted as a candidate for being asked in relation to specific testing episodes.

7.9.1.4 Privacy

The theme privacy related to a preference for concealing testing from others. Within the field of sexual health, stigma, shame and perceptions of judgement are closely linked to privacy [94, 277, 280-283]. This is because these factors influence individuals' feelings about concealment of sexual practices and health

from others [283]. To capture these different, but associated aspects of privacy, these three aspects were considered as separate domains within the theme [283, 284]. There was no reference to how these change over time within interviews therefore it was deemed appropriate to measure perceptions of stigma and judgement and feelings of shame generally, rather than in relation to specific testing episodes. Each one was considered to have low tangibility; therefore, a multi-item scale was deemed appropriate.

7.9.1.5 CONVENIENCE

The theme for convenience consisted of multiple aspects that relate to ease of access to a testing service. A multi-item scale was deemed appropriate to capture all of the aspects of convenience such as preferences around waiting time and ease of use of the service. Two specific aspects of convenience were differentiated as those that influenced choice of the service that was used for testing and could change regularly. These were the convenience of attending a clinic at the time of testing and the convenience of receiving a package in the post at the time of the test. Because of how variable these were between testing episodes it was deemed appropriate to measure these in relation to specific testing episodes. Both the convenience of attending a clinic and receiving a package in the post are highly tangible concepts, therefore these could be measured with single items.

7.9.1.6 PERCEIVED RISK OF INFECTION

Perceived risk of infection related to two specific and tangible aspects; perceived likelihood of having an infection and perceived severity of infection. Because these were specific, tangible and could be asked in relation to specific testing events, these were deemed appropriate to be measured using single item questions.

Table 7-2: Themes, sub-themes and scale length

Theme	Sub-themes	Tangibility	Scale length	Variation between testing episodes
Trust	Service reliability	Medium	Multi-item scales (2) one for clinic services, one for online services	Medium
	Reliability of information			Medium
	Service confidentiality			Medium
Subjective norms	Influence from peers	Low	Multi-item scale	Medium
	Personal identity			Medium
Self-efficacy to self-manage	Managing sexual health	Low	Multi-item scale	Medium
	Use of the website and ordering a kit	Medium	Multi-item scale	High
	Self-sampling for STIs			High
Professional support	Validity of results	Medium	Multi-item scale	Low
	Personalised information			Low
	Sexual health promotion			Low
	Judgement			Low
Privacy	Stigma	Low	Multi-item scale	Low
	Judgement	Low	Multi-item scale	Low
	Shame	Low	Multi-item scale	Low
Convenience	Cost of use	Medium	Multi-item scale	Low
	Comfort			Low
	Control			Low
	Ease of use			Low
	Time to test			Low
	Concealing testing			High
	Additional services			High
	Access at time of testing	High	Single items (2)	High
				High
Perceived risk of infection	Perceived likelihood of having an infection	High	Single item	High
	Perceived severity /type of infection	High	Single item	High

7.10 ITEM POOL GENERATION

A total item pool of 173 items was generated for the 14 scales required. These items and scales were drawn from existing literature and developed from data within qualitative interviews. Of the 173 items in the pool, 61 items were identified from existing literature and 112 items were newly developed for this study. Items identified from within existing literature are available in Appendix Q, and developed items are available in Appendix P.

7.11 ITEM AND SCALE SELECTION

Some themes related to behaviours or feelings specific to STI self-sampling at home. Other themes related to more general theoretical constructs [263]. Themes or domains that were more specific to STI self-sampling at home required a data driven approach, where items and scales were developed from data derived from qualitative interviews. Themes that related to more general constructs were corroborated with existing literature and, where appropriate, an existing scale was used.

7.11.1.1 TRUST

For trust in online services and trust in clinic services items were developed using data from qualitative interviews because the domains mainly related specifically to trust in elements of the service. Items relating to test result accuracy were sourced from existing literature[151]. Items to measure service reliability, information reliability and service confidentiality differed between the scale for trust in online services and the scale for clinic services because the characteristics of the services differed. For example, the scale for trust in online services contained an item relating to the reliability of the postal service. Additional items were required to measure the different aspects of trust in online services.

7.11.1.2 SUBJECTIVE NORMS

The theme subjective norms corroborated with existing literature based on a psychological model of behaviour change called The Theory of Planned Behaviour (TPB) [143]. The TPB is a well-established behavioural model which has an extensive body of literature regarding its use in the development of survey items [285]. The scale for subjective norms was developed by drawing on this body of literature, while tailoring the questions to the context of STI testing [285].

7.11.1.3 SELF-EFFICACY TO SELF-MANAGE

A multi-item scale relating to self-management was developed using an existing scale, the health confidence score (HCS). The HCS is a four-item scale that measures individuals' confidence in their ability to manage their own health and engage with health and care providers. The four items relate to knowledge about health, self-management of a condition, access or proficiency to navigate the relevant health care services and involvement in clinical decisions [284]. It has a required reading age of 8 years and contains 50 words. In surveys with the general public, the scale achieved good internal consistency with a Cronbach's alpha of 0.82 [284]. This measure was adapted to the context by replacing the term 'health' with 'sexual health' in two items.

To measure self-efficacy to use online services to self-sample at home, items were developed and adapted from existing items for the measurement of self-efficacy generally [286] and self-efficacy to self-test for chlamydia [150]. An item specifically related to the process of blood sample collection was included as this

was a prominent theme discussed within qualitative interviews. A multi-item scale was developed to incorporate all of the aspects of self-efficacy to self-sample.

Items for the professional support scale were developed by drawing on the language participants used to describe this in interviews. Multiple items were developed into a scale to address the different elements of the theme described in qualitative interviews relating to validity of results, personalised information and sexual health promotion. The aspect of the theme relating to judgement was measured within the scale for judgement to avoid repetition.

7.11.1.4 PRIVACY

Measures for the themes, 'Perceived stigma around testing for STIs', 'STI related shame' and 'Perceived judgement from a health care provider' were identified in a USA based study of attitudes about sexual disclosure and perceptions of stigma and shame [283]. The scale for 'Perceived stigma around testing for STIs' consisted of six items that reflected the participant's expectation of negative interactions [283]. The scale for 'STI related shame' consisted of five items reflecting participant's sense of shame and related negative affect states around testing for STIs. The scale used to measure 'Perceived judgement from a health care provider' was described as 'feelings about disclosure' in the paper from which it was derived [283]. It consisted of four items that ask the participant to describe their feelings about disclosing information about sexual intercourse, oral sex, anal sex and multiple sexual partners to a doctor or a nurse. Internal consistency was high in all three scales (STI related stigma Cronbach's alpha=0.89, STI related shame Cronbach's alpha=0.90 and perceived judgement from a health care provider Cronbach's alpha =0.80) when measured in a household sample of 142 sexually active African-American aged 13–19 years in 2002 [283]. Although the authors of the scales have not assessed reading age, the success of the scales within this young population suggests a suitable reading age for our population. These items were adapted by to the UK context by replacing the term 'STD' with 'STI'.

7.11.1.5 CONVENIENCE

In interviews participants described convenience in terms of how it specifically related to testing for STIs. Because the theme for convenience as it was described by participants was so specific to the process of testing, items were developed using data from qualitative interviews. In addition to the multi-item scale relating to feelings about convenience, the convenience of using the online or clinic service at the time of testing was measured. The convenience of attending a clinic at the time of testing and the convenience of receiving a package in the post at the time of the test were measured as single items.

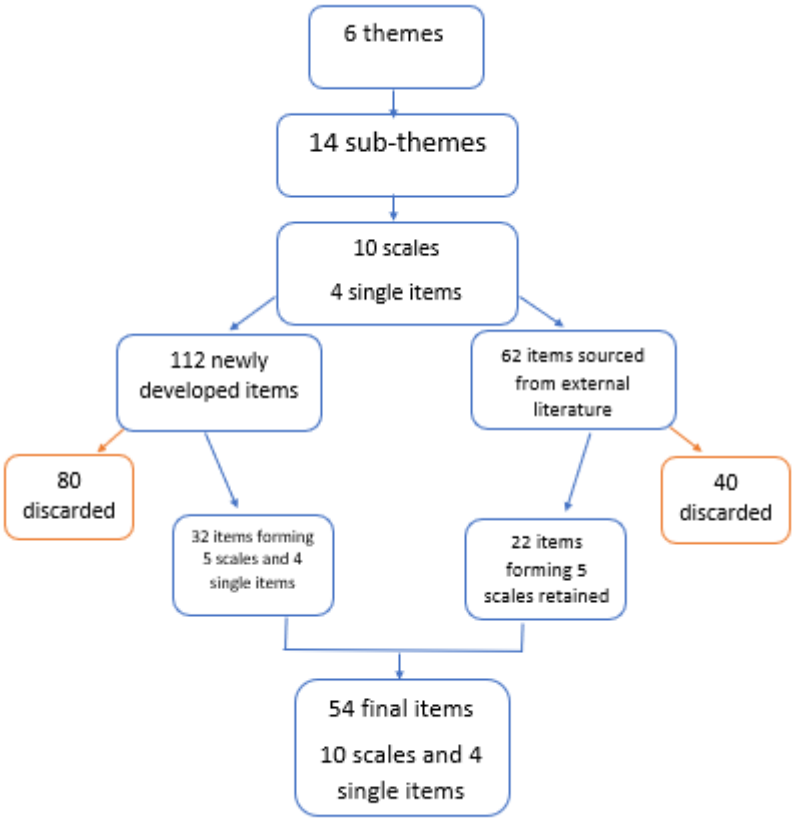
7.11.1.6 PERCEIVED RISK OF INFECTION

Perceived risk of infection related to two specific and tangible aspects; perceived likelihood of having an infection and perceived severity of infection. Because these were specific, tangible and could be asked in relation to specific testing events, these were developed as single item questions.

The final e-survey pilot tool consisted of 50 items measuring 10 scales and four single item questions. Final items of the e-survey are presented in Table 7-3. Final items were selected based on panel discussions around representativeness of themes and comprehensive cover of domains within themes. Item

redundancy was maintained with the aim of improving internal consistency. This was balanced with the requirement for parsimony in overall scale length with the aim of reducing participant fatigue. A flow chart for item selection is presented in Figure 7.2.

Figure 7.2 Flow chart for item selection for CMS



7.12 MODE OF SURVEY IMPLEMETATION

A mixed method survey implementation was designed following feedback from testing of survey items with ten peers who were not involved in the survey development. The feedback log from this pilot is available in Appendix R. Peers reported that items relating to specific testing episodes were difficult to interpret without interviewer involvement. These items related to themes for; convenience of attending a clinic at the time of testing; convenience of receiving a package in the post at the time of the test; perceived risk of infection at time of test and perceived type of infection at time of test; and self-efficacy to self-sample. Telephone surveys were designed for the administration of these items with the aim of improving interpretation, maintaining low cost of delivery and maintaining privacy for the participant. Although self-efficacy to self-sample was deemed to be highly variable between testing activities, because it was a multi-item scale, it was not feasible to measure this scale for each testing episode in the telephone survey. Items for self-efficacy to self-sample remained within the e-survey. The items for administration via telephone survey are available in Table 7-3.

Peers reported high levels of interpretability of multi-item scales relating to the remaining ten scales. E-surveys were designed for the administration of these items with the aim of increasing convenience for

participants and maintaining low cost of delivery. The items for administration via e-survey are presented in Table 7-3.

7.13 RESPONSE FORMAT

For multi-item scales, a five-point Likert scale response format was selected. Likert scales are a unidirectional psychometric response scale used to obtain a participants' preferences or degree of agreement with a set of statements that were developed in 1932 and have since been used extensively amongst survey participants [263, 287]. This format was selected due to its compatibility to the item style, appropriate level of sensitivity, the familiarity of the format amongst respondents and the extensive literature available around interpretation and analysis [288]. Three different response types were used depending on their suitability to the item being measured. A five-point response format ranging from strongly agree to strongly disagree, a five-point response ranging from not at all important to extremely important and a five-point response ranging from extremely unlikely to extremely likely. Five-point, rather than seven, ten or 11-point item response scales were used because five-point scales maintain reliability and validity while reducing participant fatigue in longer surveys [289, 290].

The response format for single item scales was chosen considering the context of the question and interpretability of the item though the mode of item administration. Because single item scales were administered via tele-phone surveys, ten-point Likert scales were used for ease of interpretation. Items and their response formats are presented in Table 7-3.

Table 7-3: Initial CMS Items, Response Format, and Mode of Administration

Theme/domain	Questions/ Response format		Source	Mode of Administration
Trust	Thinking about doing an STI test in a clinic, rate your level of agreement with following statements (0= strongly disagree…. 5= strongly agree)			
Trust in sexual health clinics	a	The information that I receive at a clinic is accurate and up to date	Newly developed	e-survey
	b	Any information about me is stored safely at the clinic		
	c	I trust the results are accurate from an STI test that is done in a clinic		
	d	The test kits they use at the clinic are accurate		
Trust	Thinking about using an NHS online service to order STI test kits to do at home rate your level of agreement with the following statements. (0= strongly disagree…. 5= strongly agree)			
Trust in online STI testing services	a	The information that is on a website like this is accurate and up to date	Newly developed	e-survey
	b	Any personal information that I would enter into the website would be stored safely		

	c	I would trust the result from the test kit that is sent to me is accurate		
	d	If the test result was positive (that I had something), I would trust it		
	e	If the test result was negative (that I didn't have an infection), I would trust it		
	f	The test kit they would send is as accurate as the ones they use in a clinic		
	g	I trust that the packaging that the test kit is sent in is discrete (private)		
	h	I would trust the postal system to deliver my samples back to the lab safely		
Subjective norms	Thinking about your friends and family, rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)			
Subjective norms	a	Many people like me take responsibility for our own health	Developed from scales within the theory of planned behaviour[285]	e-survey
	b	People like me would use online services for STI testing		
	c	People like me would test at home for STIs		
	d	People like me like using new health services		
Self-efficacy to self-manage	Thinking about doing an STI test at home rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)			
Ability to self-test	a	If doing the test meant that I would have to prick my finger I **would** be able to do it	Newly developed	e-survey
	b	Home STI testing kits are easy to use		
	c	I would be able to do the test at home as well as accurately as I could do it in the clinic		
	d	If I got stuck, I would know where to get help		
Self-efficacy to self-manage	Thinking about your sexual health rate your level of agreement with the following statements, (1= strongly disagree…. 5= strongly agree)			
Health confidence scale	a	I know enough about my sexual health	Developed from the Health Confidence Score[279] (permission for use given)	e-survey
	b	I can look after my sexual health		
	c	I can get the right help if I need it		
	d	I am involved in decisions about me		
Self-efficacy to self-manage	Still thinking about doing an STI test, rate your level of agreement with following statements (0= strongly disagree… 5= strongly agree)			

Professional support	a	When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result	Newly developed	e-survey
	b	I like that doctors and nurses are able to give me advice that is specifically for me		
	c	I like that doctors and nurses in clinics encourage me to have safe sex		
	d	It helps to have a doctor or nurse around when you're doing taking the samples for an STI test		
	e	It doesn't feel right to do an STI test without a doctor or nurse to help you		
Privacy	Thinking about if you had an STI and people knew about it, rate the following statements in terms of how likely it would be that (1=extremely unlikely…. 5 = extremely likely)			
Stigma	a	They would avoid you in the future	Developed from existing scales used in sexual health research[283]	e-survey
	b	They would think you were unclean		
	c	They would think badly of you		
	d	They would not want to be friends with you		
	e	They would be disgusted by you		
	f	They would be uncomfortable around you		
Privacy	Thinking about if you had an STI, rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)			
Shame	a	I would feel ashamed	Developed from existing scales used in sexual health research[283]	e-survey
	b	I would feel embarrassed		
	c	I would feel guilty		
	d	I would feel worried		
Privacy	Rate how likely you think a doctor or nurse would be to think less of you If you told them: (1=extremely unlikely, 5 = extremely likely)			
Judgement	a	You had sexual intercourse	Developed from existing scales used in sexual health research[283]	e-survey
	b	You had oral sex,		
	c	You had anal sex,		
	d	You had sex with lots of different people		
Convenience	Thinking about getting an STI test, rate how important the following things are to you (0 = not important at all …5= very important)			
Convenience when testing	a	You get your result quickly	Newly developed	e-survey
	b	You don't have to wait too long for a test in the waiting room		
	c	You can take a test as soon as possible		
	d	You take a test at a time that suits you		
	e	You don't have to wait for an appointment		

	f	You can get other services such as contraception, advice or see you GP		
	g	You can see a doctor or nurse		
Convenience of attending a clinic at the time of testing	a	At the time of the test, how easy or difficult was it for you to attend a clinic for STI testing? 1= extremely easy 10= extremely difficult	Newly developed	Telephone survey
Convenience of receiving a package at home	a	At the time of the test, how easy or difficult was it for you receive an STI testing kit in the post? 1= extremely easy 10= extremely difficult	Newly developed	Telephone survey
Perceived risk				
Perceived risk of infection	a	At the time of the test, can you rate how worried were you that you may have had an infection? 1 = not at all worried and 10 = extremely worried	Newly developed	Telephone survey
Perceived type of infection	a	At the time of the test, which STI were you most worried about having? Multiple answers apply	Newly developed	Telephone survey

DISCUSSION

The aim of this study was to develop an initial composite measurement scale for the barriers and facilitators to use of online services for STI self-sampling at home. In this phase of tool development, themes and domains that were identified in Chapter 6 were clearly defined for the purpose of measure development. Fifty-four survey items were developed to measure 14 theoretical domains of the six themes identified as barriers and facilitators to access to online services for STI testing at home in Chapter 6. Of the 54 items, 50 items contributed to 10 multi-item scales and four items contributed to single items. Four multi-item scales were adapted from scales in existing literature, while the remaining six multi-item scales were developed within the chapter. Telephone and e-survey implementation methods were selected for appropriate administration of scales.

This phase of survey development has many strengths. Because it follows established methodologies to develop items and scales, high levels of construct validity are maintained. Because it derives items using qualitative interviews the survey items are highly relevant to the context for which they are intended to be used. However, because survey development was not the sole purpose of the wider thesis which it serves, time constraints meant more complex item selection techniques such as blinded item sorting to improve clarity and item rating to improve content validity and scale comprehensiveness were not employed [263]. Additionally, survey development could have drawn more on existing social theory. By drawing on social theory when developing the items, it would have ensured that the themes remained grounded in established

theory [263]. The survey is implemented using two modalities. Using two modalities to implement the same scale can result in measurement bias due to systematic differences in the way respondents answer items on the phone or online [263]. However, because the same modality is used for the same items for all respondents, item responses will not vary by modality between users. Furthermore, no bias is introduced through combining different modalities to implement the same scale as only single items that do not form part of multi-item scales are collected via the phone survey. No formal cognitive testing was carried out. Carrying out formal cognitive testing may have improved the validity of scales, particularly among newly developed scales [276]. Finally, multi-item scales are relatively short and may fail to capture the complexity of some of the themes.

Other studies of self-management in sexual health have used similar techniques to identify the factors influencing use of self-management [149, 150]. A study in the UK, investigating perceptions of self-testing for chlamydia also used qualitative interviews to establish uses perceptions of self-testing and developed scales to measure theoretical constructs using both social theory and guidelines, however the psychometric properties of the scales that were reported were limited to internal reliability [149, 150]. Similarly, a study in the Netherlands that investigated the psychological determinants of self-testing for cholesterol, glucose and HIV used qualitative interviews and social theory to develop items survey items. However, this study used broad spectrum possible psychological determinants derived from existing social theory, rather than specifically related to the practice. Like the UK study, the Netherlands study reports internal reliability of the items, but no other psychometric properties [151].

This chapter describes the development of items for a CMS for the barriers and facilitators to use of online services for self-sampling at home. On the basis of qualitative interviews theoretical constructs were defined. These definitions were used to develop 54 items that form the initial CMS. The psychometric properties of the multi-item scales from the CMS established in Chapter 8. Because items within the tele-survey only consisted of single item scales, assessment of internal reliability, equivalence reliability and construct validity was not required.

Chapter 8 PSYCHOMETRIC EVALUATION OF THE COMPOSITE MEASUREMENT SCALE

INTRODUCTION

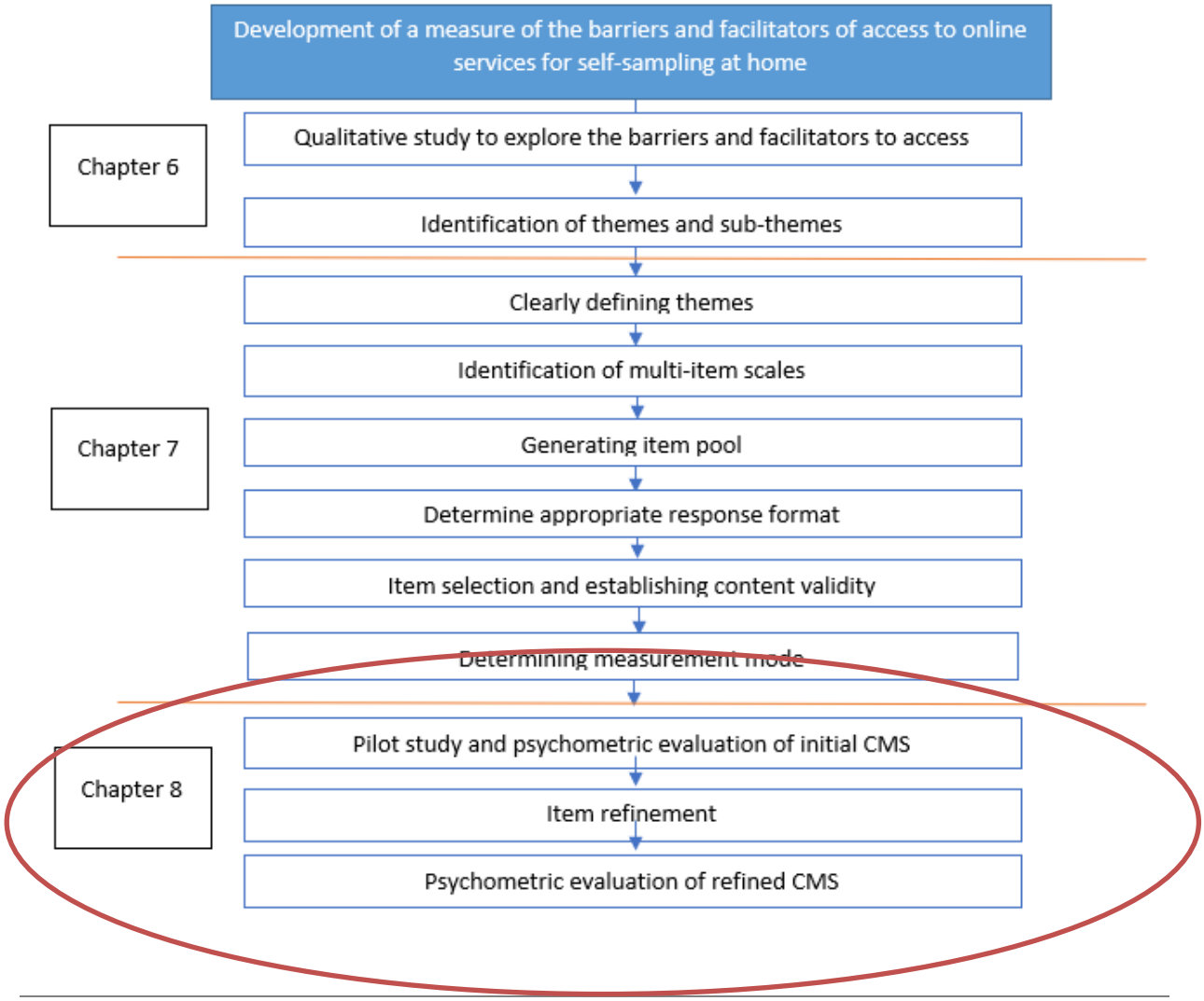
There are three stages in the development of a composite measurement scale (CMS) for the barriers and facilitators to use of online self-sampling at home (Figure 8.1). The first (qualitative interviews) and second (tool development) were discussed in Chapters 6 and 7 respectively. This chapter presents the stage phase of tool development which establishes the psychometric properties of 10 multi-item scales which form the content of the Gettested e-survey.

The content of the scales is derived from qualitative interviews that were carried out with participants of the Gettested Trial who were invited to use an online service. In phase one (Chapter 6) of survey development, descriptive analysis of these interviews generated six major themes representing the barriers and facilitators to use of online services for self-sampling at home. In Chapter 7, these themes were defined and survey items making up 10 multi-item scales and four single items, were generated to develop the initial CMS, and content validity were established with a panel of experts.

The multi-item scales in the initial CMS measure barriers and facilitators to use of online services among the ten domains of six major themes: trust, subjective norms, self-efficacy to self-manage, professional support, privacy and convenience. Each scale is made up of multiple items measuring a single domain. In phase three of survey development, data is collected and analysed to explore the psychometric properties of the CMS, the items are refined then the psychometric properties of the refined tool are established.

PROCESS OVERVIEW

Figure 8.1: Process Overview



AIMS

1. To explore the psychometric properties of the scales within the initial version of the CMS.
2. To refine the items within the CMS to establish higher levels of reliability, validity and parsimony in scales within the survey.
3. To establish the psychometric properties of the refined scales within the CMS.

METHODS

8.1 STUDY DESIGN

This cross-sectional study was carried out in two stages and involved the analysis of data from two populations. Stage one explored the psychometric properties of the initial CMS tool and refined items and stage two confirmed the psychometric properties of the refined tool. Stage one involved pilot data collection, assessment of the CMS reliability, validity, feasibility and item refinement. Stage two involved the psychometric analysis of the refined tool on a larger survey population and includes, refined tool reliability and confirmatory factor analysis and feasibility. A COSMIN checklist [291] has been completed to ensure standards have been met for methodological quality of the tests carried out during the development of the CMS (Appendix S).

8.2 STUDY SETTING AND DATA COLLECTION

The study was carried out among participants who lived in the London boroughs of Lambeth and Southwark. These boroughs are densely populated and ethnically diverse with high levels of deprivation [220, 292] and high and increasing rates of STI diagnoses [23]. A more detailed description of the population of the boroughs of Lambeth and Southwark can be found in Chapter 4.

8.2.1.1 STAGE ONE

The pilot study (stage one) involved data collection from users of the Camberwell Sexual Health Clinic. The clinic serves over 120,000 users a year, providing a range of sexual health services, including STI testing and treatment, contraceptive services, psychosexual counselling and abortion referral. Most services are offered on a walk-in basis, although some appointments are available for conditions requiring assessment from a clinician or treatment. The median age of users is 29 years (IQR= 24, 37), most attendees are female (62%). The population accessing the clinic are ethnically diverse, with only 24% of users reporting as white British [293].

Surveys were carried out with users of the sexual health centre over a five-week period between June 2016 and July 2016 by two researchers (Sharmani Barnard and Jonathan Syred). Researchers approached users in the waiting room during opening times when the volume of users was typically high. Users of the centre were asked if they were willing to take part in a pilot study while they waited in the waiting room. Participants were approached individually by researchers who explained the aim of the pilot and what was required. No demographic details were collected from participants and surveys were anonymous. Participants who were willing to take part were asked to return the surveys to a box on completion. Participants did not receive any remuneration for their time.

8.2.1.2 STAGE TWO

The data collection for stage two involved surveying a sub-set of participants from the Gettested Trial. Detailed information about the Gettested Trial is available in Chapter 4.

RCT participants (n=1431) who had agreed to be contacted to take part in future research were eligible for inclusion in the stage two sample. Of the 1431 participants who indicated they would be willing to take part in future research, 886 (61.91%) were female, 541 (37.81%) were male and 4 (0.28%) were transgender.

Most potential participants were white British (74.77%), while 9.22% were black British, 5.59% were Asian and 9.01% identified as mixed or multiple ethnicities. Potential participants were aged between 16 and 30 years, 18.81% were aged 16-19 years, 42.87% were aged between 20 and 24 years and 38.32% were aged between 25 and 30 years.

The survey was carried out between 11th August 2016 and 24th December 2016. Participants were invited to take part via text message and email which included a link to the survey. Of the 1431 participants that were invited to take part, 877 (61.24%) agreed to take part and completed the e-survey. The mean completion time for the e-survey was 5 minutes 20 seconds. The e-survey contained 49 items, contributing to 10 multi-item scales relating to barriers and facilitators to use of online services for STI self-sampling at home. Participants were required to complete all items on the e-survey prior to submission. Participants were sent £10 remuneration by post. This study analysed the results of the e-survey, which contained 10 scales that had been refined after exploratory analysis in stage one.

To assess the reliability of the scale, a sub-sample of 22 participants completed the survey twice, with a 14-day interval between the first and second survey. These participants were sent an additional £10 remuneration once the second survey had been completed.

8.3 SAMPLE SIZE

The sample size for both populations was determined by the sample size requirements for factor analysis. Determination of sample size for factor analysis can be done in one of two ways: a minimum subject to variable (STV) ratio per scale, or conditional upon the strength of the factors and the items [294]. STV ratios have been commonly used in psychometric evaluations, with a common rule of including at least 10 cases for each item in the scale [294, 295]. However, STV has been subject to extensive criticism, suggesting these criteria do not provide an accurate guide to sample size estimates [296-298]. Instead, the consensus within the literature now suggests that sample sizes are more accurately calculated by considering the strength of the factors and their items [294]. The criterion for determining sample size using this method states:

1. If the factors have four or more items with loadings of .60 or higher, then the size of the sample is not relevant.
2. If the factors have 10 to 12 items that load moderately (≥0.30), then a sample size of 150 or more is needed to be confident in the results.
3. If factors are defined with few variables and have moderate to low loadings, a sample size of at least 300 is needed [294, 299].

However, using this method to determine sample size relies on pre-existing data, therefore the adequacy of a sample cannot be established until the data has been collected and the analysis has been carried out.

For the pilot study (stage one), because there was no existing data to base the sample size on and this analysis was exploratory in nature, the study aimed to recruit at least 200 participants, assuming at least 75% would complete all items within the survey. Analysing results from 150 participants would satisfy the

STV ratio for the largest scale being tested (8 items) and allow for moderate loading of factors within each scale.

The sample size for stage two was determined by the number of participants needed for exploratory multivariate analysis. Because this analysis was exploratory, the aim was to recruit as many of the potential participants as possible, setting a target of a minimum of 800 participants, which satisfied sample size conditions for factors with few variables that have moderate loadings in confirmatory for factors analysis (>300).

The subsample size for the analysis of test-retest reliability was determined by what is required to establish Lin's Concordance Correlation (Lin's p^c). This can be established with samples as small as 10 participants [300]. The study aimed to recruit at least 20 participants for test-retest reliability to satisfy this sample size.

8.4 INITIAL COMPOSITE MEASUREMENT SCALES

Table 8-1 presents only the multi-item scales for testing in this phase. The tool consists of 50 items, measuring 10 scales.

Table 8-1: Initial Composite Measurement Scales

	Items (Survey questions)	
Theme: Convenience	1. Thinking about getting an STI test, rate how important the following things are to you (1= not important at all …5= very important)	
Scale: convenience when testing	1a	You get your result quickly
	1b	You don't have to wait too long for a test in the waiting room
	1c	You can take a test as soon as possible
	1d	You take a test at a time that suits you
	1e	You don't have to wait for an appointment
	1f	You can get other services such as contraception, advice or see you GP
	1g	You can see a doctor or nurse
Theme: Self-management	2. Still thinking about doing an STI test, rate your level of agreement with following statements (1= strongly disagree… 5= strongly agree)	
Scale: Professional support	2a	When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result
	2b	I like that doctors and nurses are able to give me advice that is specifically for me
	2c	I like that doctors and nurses in clinics encourage me to have safe sex
	2d	It helps to have a doctor or nurse around when you're doing taking the samples for an STI test
	2e	doesn't feel right to do an STI test without a doctor or nurse to help you
Theme: Trust	3. Still thinking about doing an STI test in a clinic, rate your level of agreement with following statements (1= strongly disagree…. 5= strongly agree)	
Scale: Trust in sexual health clinics	3a	The information that I receive at a clinic is accurate and up to date
	3b	Any information about me is stored safely at the clinic
	3c	I trust the results are accurate from an STI test that is done in a clinic
	3d	The test kits they use at the clinic are accurate
Theme: Trust	4. Thinking about using an NHS online service to order STI test kits to do at home rate your level of agreement with the following statements. (1= strongly disagree…. 5= strongly agree)	
Scale: Trust in online STI testing services	4a	The information that is on a website like this is accurate and up to date
	4b	Any personal information that I would enter into the website would be stored safely
	4c	I would trust the result from the test kit that is sent to me is accurate
	4d	If the test result was positive (that I had something), I would trust it
	4e	If the test result was negative (that I didn't have an infection), I would trust it
	4f	The test kit they would send is as accurate as the ones they use in a clinic

	4g	I trust that they would send me the test kit in a package that doesn't look like it's an STI test.
	4h	I would trust the postal system to deliver my samples back to the lab safely
Theme: Self-efficacy to self-manage	5. Thinking about doing an STI test at home rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)	
Scale: self-efficacy to self-test	5a	If doing the test meant that I would have to prick my finger I **would** be able to do it
	5b	Home STI kits are easy to use
	5c	I would be able to do the test at home as accurately as I could at the clinic
	5d	If I got stuck, I would know where to get help
Theme: Subjective norms	6. Thinking about your friends and family, rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)	
Scale: Subjective norms	6a	Many people like me take responsibility for our own health
	6b	People like me would use online services for STI testing
	6c	People like me would test at home for STIs
	6d	People like me like using new health services
Theme: Self-efficacy to self-manage	7. Thinking about your sexual health rate your level of agreement with the following statements, (1= strongly disagree…. 5= strongly agree)	
Scale: Health confidence scale	7a	I know enough about my sexual health
	7b	I can look after my sexual health
	7c	I can get the right help if I need it
	7d	I am involved in decisions about me
Theme: Privacy	8. Now thinking about if you had an STI and people knew about it, rate the following statements in terms of how likely it would be that (1=extremely unlikely…. 5 = extremely likely)	
Scale: Stigma	8a	People would avoid you?
	8b	People would think you were unclean?
	8c	Other people would think badly of you?
	8d	Other people would not want to be friends with you?
	8e	Other people would be disgusted by you?
	8f	Other people would be uncomfortable around you
Theme: Privacy	9. Still thinking about if you had an STI, rate your level of agreement with the following statements (1= strongly disagree…. 5= strongly agree)	
Scale: Shame	9a	I would feel ashamed
	9b	I would feel embarrassed
	9c	I would feel guilty
	9d	I would feel worried
Theme: Privacy	10. Rate how likely you think a doctor or nurse would think less if you If you told them: (1=extremely unlikely, 5 = extremely likely)	
Scale: Judgement	10a	You had sexual intercourse
	10b	You had oral sex,
	10c	Had anal sex,
	10d	Had sex with lots of different people

8.5 DATA ANALYSIS

8.5.1.1 PSYCHOMETRIC EVALUATION OF THE CMS

Analysis was carried out using STATA 15 [301]. Items were recorded on a five-point ordinal scale therefore median and interquartile range were reported for descriptive purposes. Stage one explored the factor structure of the initial survey, while in stage two the reliability, validity and feasibility of the refined survey was established.

All scales were unidirectional therefore there was no need to reverse the polarity of the scales.

8.5.1.2 RELIABILITY

Reliability is a necessary but not sufficient component of the validity of a measure. It indicates how well a scale can consistently measure a construct and can relate to equivalence reliability or stability reliability. Equivalence reliability was assessed in both stage one and stage two and concerns the internal consistency of a scale. Internal consistency measures how well items in a tool fit together conceptually. This includes whether all items in the measure reliably measure the domain and whether participants score similarly on like measures. Stability reliability concerns repeatability. It relates to aspects of a measure which are not expected to change, such as testing the same item on the same individual at different times [270]. Stability reliability was assessed in stage two of this study when the test-retest reliability of the refined CSM was established.

8.5.1.2.1 Equivalence reliability

Equivalence reliability was evaluated in stages one and two. The internal consistency of each scale was assessed using Cronbach's Alpha and the average inter-item correlations. Cronbach's alpha is expressed as a value between 0 and 1 that describes the interrelatedness of the items within the scale, as well as the error in the scale. If items in the scale are correlated with each other, the value is increased. Cronbach's Alpha is, however, sensitive to the length of the scales as more items return higher values of Alpha. Therefore, the number of items in the scale was considered when evaluating the score [302]. Cronbach's Alpha scores were assessed with a lower criterion of <0.70 indicating low internal consistency and an upper criterion for inclusion of >0.91 indicating potential item redundancy [303].

Inter-item correlations for scales were also assessed. Inter-item correlations measure the extent to which scores on one item are related to scores on all other items in a scale providing an assessment of item redundancy. The inter-item correlations were assessed with a lower criterion of ≤0.20 to mean items or scales have poor inter-item correlations, suggesting they are not really related to each other and an upper criterion of ≥0.40 to indicate potential item redundancy within the scale [304]. Higher levels of inter-item correlation were viewed conservatively as the potential impact of item redundancy was considered less severe than scales having poor inter-item correlations.

In stage one, item level correlations are presented between the item and the scale (item test), the correlation between the item and the other scores (item-rest), average inter-item correlation if item is deleted and alpha if item is deleted. In stage two average inter-item correlation and Cronbach's Alpha for refined scales are presented.

8.5.1.2.2 Stability reliability

Stability reliability was evaluated in stage two. Test-retest reliability ensures that the measurements obtained in one test are stable over time. It compares responses given by individuals over two time-points to mitigate against conclusions about the outcome of the measure being related to time or timing of the implementation of the measure.

Test-retest reliability was measured by assessing the level of agreement between the summary scale measures obtained at time point one and time point two using Lin's Concordance Correlation [300]. A concordance correlation coefficient (CCC) rho value of <0.20 indicated poor level of agreement, values ≥0.20≤0.80 as moderate agreement and >0.80 as excellent agreement [305, 306].

8.5.1.3 CONSTRUCT VALIDITY

Construct validity refers to the degree to which a scale measures the domain which it is intended to measure. Scale content and face validity were assessed in Chapter 7. Face validity is the degree to which the scale measures the theme that it aims to measure [263]. In this chapter, construct validity was assessed through factor analysis using latent variable models. Factor analysis uses latent variable models to describe the relationship between observed survey items and a latent or unobserved construct, which in the context of this study are described as domains. The assumption is that several observed items are influenced by the same latent construct and the existence of correlation between these items is evidence of a common source of influence [263, 307].

Factor analysis can be carried out in an exploratory way, or a confirmatory way. Exploratory factor analysis (EFA) is an exploratory method that is used to generate theory by establishing underlying dimensions between items, variables and latent constructs (themes). By exploring these dimensions, theory can be refined, therefore it is central to construct validity [263, 307, 308]. It is typically used during instrument development, when there are no a priori expectations of factor structure to identify the number of latent variables that underlie a set of items. Once the dimensions between variables have been established, confirmatory factor analysis (CFA) can then be used to confirm the hypothesis that a set of items intended to measure a particular underlying construct are consistent with the assumed structure [309]. This study first established underlying dimensions between variables using EFA, then confirmed them using CFA.

8.5.1.3.1 EXPLORATORY FACTOR ANALYSIS

In stage one of this study, EFA was used to explore the relationship between items to identify whether they load together on to the hypothesised theoretical constructs [263, 310]. It was employed to determine the structure of the data. This study used a general linear factor model to allow for multiple latent factors. A polychoric correlation was specified to account for item responses being ordinal [311]. The general form is takes for *p* items and *q* factors is:

$$x_1 = \alpha_{i0} + \alpha_{i1}f_1 + \alpha_{i2}f_2 \ldots . + \alpha_{iq}f_q + e_i \quad (i= 1,\ldots.p)$$

Where f_1, f_2 … f_q are the factors or latent variables, e_i are the residuals and α_1 , α_2,.. α_q are the factor loadings. Factor loadings represent the covariances between latent variables conditional on the factor [307]. Latent variables are standardised to unit variances, giving factor loadings on a scale of correlations, therefore making interpretation of results easier.

The model assumes that:

1) The factors are not correlated with each other and not correlated with the variances.
2) Each factor has a mean of 0 and a variance of 1
3) Variances are uncorrelated with each other
4) Each error has a mean of zero, but variances may differ
5) Both factors and errors follow a multivariate normal distribution.

The model fit involves finding the values of the parameters which make the observed correlation matrix as close as possible to that predicted by the model. The methods for fitting a model develop a measure of the distance between the observed and predicted correlation matrices. In this study, maximum likelihood methods were used to fit the model. These use a distance that arises naturally when the assumption is made that both the factors and variances follow a normal distribution but is appropriate for describing non-normally distributed data.

In multiple factor models, the process of rotation is used to identify a solution which describes the minimum distances between items. It aims to achieve a new set of loadings with a simple structure to help interpretation. This process transforms the factors and the estimated factor loadings but does not affect the number of factors in the model or the fit of the model by redistributing the explained variance across the factors. The different types of rotation are given names that describe the geographical representation of the procedure. In this study, orthogonal rotation is used to identify the simplest structure within the data i.e. each item has a large contribution from only one factor, with close to zero contributions from other factors [263, 307]. Oblique, or non-orthogonal rotations were not required as a simple structure was identified using orthogonal rotation.

The number of factors retained in the model was determined by considering the theoretical background of the tool and interpretability as well as statistical considerations. Theoretically, ten factors were identified within qualitative interviews. The number of factors in the model were then established using the eigenvalue rule, thereby retaining factors with an eigenvalue of >1.00 [263].The consequences of over factoring were considered as less severe than those of under factoring, therefore if the number of factors with an eigenvalue >1.00 exceeded what was theoretically identified in qualitative interviews, these were included in the model [299].

Factor loadings were interpreted by examining the pattern of the loadings across observed items on a factor. Factor loadings ≥0.40 were considered as moderate to high factor loadings [311].

8.5.1.3.2 CONFIRMATORY FACTOR ANALYSIS

CFA was carried out in stage two of the study. It was employed to provide a statistical criterion for how well the data fit the scale models that had been identified and refined in stage one. CFA methods were used to

improve the fit of the prespecified models by reducing the number of constraints and to allow for more parameters to be estimated.

Path diagrams were used as a graphical representation of the CFA models. These diagrams present the relationships between the observed items and latent factors and between covariates and the latent variables and include error terms or residuals [263, 307]. In path diagrams presented in this study, latent factors appear in large circles, observed items appear in rectangles and error terms appear in small circles. Relationships between observed items and latent factors are depicted by a straight arrow with the arrowhead pointing to the dependent variable. Correlations between errors are depicted with a curved arrow. Arrowheads at both ends of a line indicate a reciprocal relationship.

Measurement models for structural equation modelling use slightly different notation from the measurement models for EFA. Latent factors are denoted with the Greek letter ξ_j (instead of f_j) and the error term will be denoted as δ_j (instead of e_i). In the mathematical model below, x_i denotes the observed item, ξ_1 is the latent factor and δ_i is the item specific error. The measurement model for a single factor CFA takes the form of:

$$x_1 = \alpha_{10} + \alpha_{11}\xi_1 + \delta_1$$
$$x_2 = \alpha_{20} + \alpha_{21}\xi_1 + + \delta_2$$
$$x_3 = \alpha_{30} + \alpha_{31}\xi_1 + + \delta_3$$
$$x_4 = \alpha_{40} + \alpha_{41}\xi_1 + + \delta_4$$
$$x_5 = \alpha_{50} + \alpha_{51}\xi_1 + + \delta_5$$
$$x_6 = \alpha_{60} + \alpha_{61}\xi_1 + + \delta_6$$

Using this model, each item was restricted to loading on to a single factor. The SEM models were fit using STATA15 *sem* command. The model was specified using asymptotic distribution-free (ADF) estimators because this allows ordinal categories in the observed items [312]. Missing data were deleted using the listwise method. Listwise deletion deletes the observation from the model which lacks data and results in complete case analysis [313]. Standardised factor solutions were used, where both the observed items and latent factors have been standardised to have zero means and unit variances.

To avoid misspecification of the indicator error variances, correlation between errors (error covariances) were added to models. Correlated errors between items indicate that some of the variation not explained by the latent factor is due to another exogenous common cause (between items). In the context of this study, correlated errors could arise from similarly worded items or items differentially prone to social desirability [311]. The consequences of misspecification of CFA models by not including error correlations include higher factors loadings among items that have error correlations and poor model fit. Including appropriate error correlations within the fitting of CFA models frees up this parameter and improves model fit [311]. Modification indices were used to identify correlated errors and the decision to include error correlations was considered along with the magnitude of the expected parameter change. Borderline modification indices (larger than 3.84 but not resulting in a large parameter change) were not considered

appropriate to avoid overfitting of the model and unstable estimates [311]. The theoretical basis for error correlations was considered along with modification indices.

The adequacy of the model was tested using three goodness of fit criteria: Comparative Fit Index (CFI) ≥ 0.95, Tucker Lewis Index (TLI) ≥ 0.95 and the Root Mean Square Error of Approximation (RMSEA) ≤0.05. Chi-squared test p-value ≥ 0.05 was not considered as an appropriate test statistic because it, can be inclined to reject adequately fitted models where the sample size is large, which is the case in this study [314]. The model was considered to be a good fit if two of the three indices criteria were met. Factor loadings of ≥ 0.40 were considered to be an indicator that the item was meaningfully related to the latent factor[311].

8.5.1.4 FEASIBILITY

Feasibility of the tool was considered by noting the time taken for participants to carry out the survey and the proportion of surveys returned as incomplete. These were subjectively assessed during the pilot, then confirmed with objective time measures in stage two. The total survey was considered as feasible if the typical completion time was within 20 minutes. Typical completion time was calculated by removing any responses <1 second, dividing the number of seconds taken to complete the survey in to 5 second slots, calculating mode and multiplying it by five. The number of participants that started the survey and did not complete was also considered in feasibility. It was considered as feasible if >60% of those that started the survey subsequently completed it. The device that participants completed the survey on was also reported. The survey was designed to be completed using a mobile device, therefore the design was considered acceptable if >50% had completed using a mobile phone.

8.5.1.5 ITEM REFINEMENT AND REDUCTION

At the end of stage one, items were refined with the aim of improving the properties of the scales while preserving content validity. Items were assessed based on non-response in the pilot survey, feedback from users and further input from a methodological expert and the expert panel. Details of the expert panel and methodological expert is available in Appendix O.

Item reduction was considered for items that performed poorly in stage one psychometric tests. Any item reduction was carried out after considering i) the internal reliability of the item within the scale, ii) the items performance in EFA and iii) theoretical grounding for removal of the item, considering the different dimensions and or subdimensions of the scale. All authors (Sharmani Barnard, Dr Paula Baraitser, Professor Caroline Free and Dr Ioannis Bakolis) discussed grounds for retention and removal of items.

RESULTS

8.6 STAGE ONE

8.6.1.1 PILOT SURVEY OF INITIAL CMS

Two-hundred and five participants completed the pilot survey which contained 10 scales and 50 items. Not all participants completed all items in the survey, therefore the number of observations for each item varied, from between 180 to 201 and the number of observations for each scale ranged from 174 to 184. In total, 129 participants completed all 51 items in the CMS, resulting in a ratio of items to participants of 1:12. The number of observations for each item, scale and the median and interquartile range (IQR) for item scores are presented in Table 8-2.

8.6.1.2 EQUIVALENCE RELIABILITY

The equivalence reliability of each survey scale is presented in Table 8-2. All 10 scales had an average inter-item correlation ≥0.20, however all scales except for the scale for convenience and professional support have inter-item correlations ≥0.40, suggesting some level of item redundancy. Table 8-2 presents the average inter-item correlation if items are deleted from scales. All scales had Cronbach's alpha scores ≥0.70, suggesting high levels of internal reliability. Deletion of items did not increase alpha values among any of the scales.

Table 8-2: Equivalence reliability for items and scales in the initial CMS

Construct		Obs	Median	IQR	Item-test correlation	Item-rest correlation	Average inter-item correlation if item is deleted	Alpha if item deleted	Inter-item correlation	Cronbach's alpha
Convenience when testing n=175	a.	200	5	4,5	0.69	0.53	0.34	0.76	0.34	0.79
	b.	194	4	4,5	0.68	0.50	0.35	0.76		
	c.	201	4	4,5	0.73	0.60	0.32	0.74		
	d.	191	4	4,5	0.65	0.49	0.35	0.76		
	e.	193	4	3,5	0.70	0.55	0.33	0.75		
	f.	190	4	3,5	0.58	0.40	0.37	0.78		
	g.	194	4	3,5	0.66	0.50	0.35	0.76		
Trust in clinic services n=180	a.	196	4	4,5	0.85	0.72	0.58	0.81	0.60	0.85
	b.	196	4	4,5	0.83	0.70	0.60	0.82		
	c.	199	5	4,5	0.87	0.75	0.56	0.79		
	d.	185	4	4,5	0.81	0.64	0.64	0.84		
Trust in online services n= 174	a.	190	4	4,5	0.76	0.67	0.58	0.90	0.57	0.91
	b.	190	4	4,5	0.75	0.65	0.58	0.91		
	c.	191	4	4,5	0.85	0.79	0.55	0.89		
	d.	191	4	4,5	0.79	0.72	0.56	0.90		
	e.	191	4	3,5	0.80	0.72	0.56	0.90		
	f.	191	4	4,5	0.82	0.74	0.55	0.90		
	g.	193	4	3,5	0.76	0.67	0.57	0.90		
	h.	191	4	4,5	0.78	0.68	0.57	0.90		
	a.	190	4	3,5	0.74	0.52	0.56	0.79	0.50	0.80

Self-efficacy to self-test n=178	b.	180	4	3,4	0.83	0.67	0.46	0.72		
	c.	189	4	3,4	0.86	0.72	0.43	0.69		
	d.	187	4	3,5	0.75	0.54	0.55	0.79		
Professional support n=178	a.	191	3	3,4	0.67	0.46	0.41	0.74	0.39	0.76
	b.	197	4	4,5	0.73	0.52	0.38	0.71		
	c.	194	4	3,5	0.71	0.47	0.41	0.73		
	d.	191	4	3,4	0.79	0.64	0.34	0.67		
	e.	193	3	2,4	0.72	0.52	0.39	0.72		
Health Confidence Score n=187	a.	190	4	3,5	0.82	0.66	0.58	0.81	0.57	0.84
	b.	190	4	4,5	0.84	0.70	0.55	0.79		
	c.	192	4	4,5	0.82	0.64	0.58	0.81		
	d.	190	4	4,5	0.82	0.67	0.57	0.80		
Subjective norms n=184	a.	191	4	4,5	0.60	0.31	0.57	0.80	0.42	0.74
	b	191	4	3,4	0.86	0.71	0.31	0.57		
	c.	191	4	3,4	0.86	0.72	0.31	0.57		
	d.	190	4	3,4	0.70	0.43	0.48	0.74		
Shame n=180	a.	192	3	2,4	0.93	0.86	0.76	0.91	0.78	0.93
	b.	193	3	2,4	0.90	0.82	0.79	0.92		
	c.	181	2	2,3	0.90	0.83	0.79	0.92		
	d.	185	3	2,4	0.92	0.85	0.77	0.91		
Stigma n=184	a.	187	2	1,3	0.88	0.83	0.79	0.95	0.78	0.95
	b.	188	2	2,3	0.88	0.83	0.79	0.95		
	c.	186	2	1,3	0.91	0.87	0.77	0.94		
	d.	188	2	1,3	0.91	0.86	0.77	0.94		
	e.	189	2	1,3	0.92	0.88	0.77	0.94		
	f.	188	2	1,3	0.91	0.86	0.77	0.94		
Judgement n=184	a.	187	2	1,3	0.85	0.73	0.72	0.88	0.69	0.90
	b.	188	2	1,3	0.92	0.85	0.63	0.84		
	c.	187	2	1,3	0.90	0.82	0.66	0.85		
	d.	186	2	1,4	0.83	0.70	0.74	0.90		

8.6.1.3 EXPLORATORY FACTOR ANALYSIS

One hundred and twenty-nine participants answered all 50 items within the survey. Based on eigenvalues, visual inspection of the scree plot (Figure 8.2) and consideration of the number of domains identified in qualitative interviews, 11 factors were extracted. The total variance explained by the 11 factors was 77.5%. After initial factor extractions, the common factors were rotated using orthogonal (varimax) rotations. Table 8-3 shows loadings ≥0.40 of each item on the 11 extracted factors after orthogonal rotation. The unrotated correlation matrix and the full rotated correlation matrix are available in appendix T and U respectively.

All items in the scales for shame, 'HCS' and 'judgement' had high loadings (>0.70) on single factors (factors 3, 5, and 7 respectively), with no items from other scales having moderate or high loadings on them (>0.40).

All four items from the scale ‘ability to self-test’ loaded moderately on to factor 10. All four items in the scale ‘subjective norms’ loaded together (>0.40) on to factor 9, however, items b-d had high loadings (>0.61), while item a only loaded moderately on to the scale (0.40).

All items from the scale ‘trust in online services’ had loadings of 0.61 and higher for all of the eight items on factor 1. In addition to items from the scale ‘trust in online services’, item b from the scale ‘trust in clinic services’ and item d from the scale ‘ability to self-test’ also loaded moderately (0.41) on factor 1.
All six items within the ‘stigma’ scale had high loadings of 0.84 and above on factor 2. In addition to items from the stigma scale, factor 2 had moderate loadings from item d from the scale for shame (0.40) and items a (0.42), b (0.52) and c (0.52) from the judgement scale.

Five items, (items a-e) in the scale ‘feelings about convenience when testing’ loaded together moderately high (>0.63) on factor 4. Items f and g from the scale loaded on factor 8, together with items a-c from the scale ‘professional support’.

All four items from the ‘trust in clinic services’ scale had high loadings on factor 6 (>0.62). In addition to items from the ‘trust in clinic services’ scale, factor 6 had moderate loadings from item a (0.43) from the scale for subjective norms.

Three items (a-c) from the scale ‘professional support’ loaded on to factor 8, along with items f and g from the ‘feelings about convenience when testing’ scale. Items d and e from the professional support scale loaded on to factor 11.

Figure 8.2: Scree plot of eigenvalues. Dotted line indicates Eigenvalue of 1.

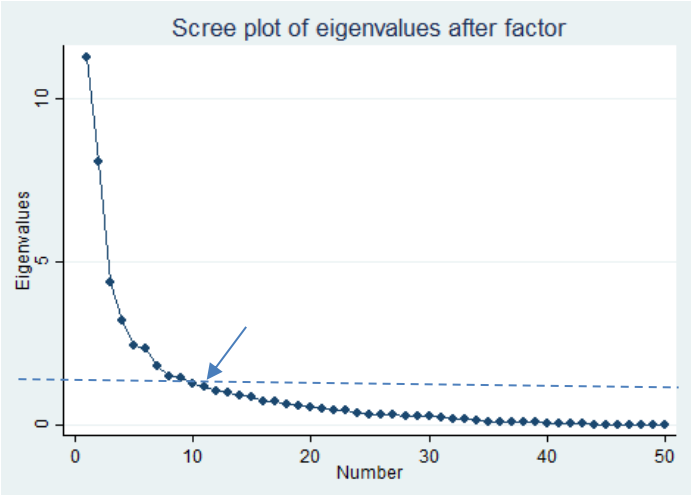


Table 8-3- Loadings (≥0.40) of eleven rotated factor patterns using polychoric correlation and maximum likelihood estimations N=129

Theme	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
Convenience when testing											
a. You get your result quickly				0.75							

b. You don't have to wait too long for a test in the waiting room				0.79							
c. You can take a test as soon as possible				0.71							
d. You take a test at a time that suits you				0.63							
e. You don't have to wait for an appointment				0.81							
f. You can get other services such as contraception, advice or see you GP								0.55			
g. You can see a doctor or nurse								0.66			
Trust in clinic services											
a. The information that I receive at a clinic is accurate and up to date						0.76					
b. Any information about me is stored safely at the clinic	0.41					0.69					
c. I trust the results are accurate from an STI test that is done in a clinic						0.76					
d. The test kits they use at the clinic are accurate						0.62					
Trust in online services											
a. The information that is on a website like this is accurate and up to date	0.61										
b. Any personal information that I would enter the website would be stored safely	0.70										
c. I would trust the result from the test kit that is sent to me is accurate	0.84										
d. If the test result was positive (that I had something), I would trust it	0.82										
e. If the test result was negative (that I didn't have an infection), I would trust it	0.80										
f. The test kit they would send is as accurate as the ones they use in a clinic	0.84										
g. I trust that they would send me the test kit in a package that doesn't look like it's an STI test.	0.80										
h. I would trust the postal system to deliver my samples back to the lab safely	0.86										
Self-efficacy to self-test											
a. If doing the test meant that I would have to prick my finger I would be able to do it										0.75	
b. Home STI kits are easy to use										0.72	
c. I would be able to do the test at home as accurately as I could at the clinic										0.63	
d. If I got stuck, I would know where to get help	0.41									0.52	
Professional support											
a. When I go to get a test, seeing a doctor or nurse makes me feel less								0.52			

scared about the test result											
b. I like that doctors and nurses are able to give me advice that is specifically for me								0.73			
c. I like that doctors and nurses in clinics encourage me to have safe sex								0.66			
d. It helps to have a doctor or nurse around when you're doing taking the samples for an STI test											0.73
e. It doesn't feel right to do an STI test without a doctor or nurse to help you											0.82
HCS											
a. I know enough about my sexual health					0.84						
b. I can look after my sexual health					0.79						
c. I can get the right help if I need it					0.77						
d. I am involved in decisions about me					0.77						
Subjective norms											
a. Many people like me take responsibility for our own health						0.43			0.42		
b. People like me would use online services for STI testing									0.85		
c. People like me would test at home for STIs									0.80		
d. People like me like using new health services									0.61		
Shame clinic											
a. I would feel ashamed			0.87								
b. I would feel embarrassed			0.89								
c. I would feel guilty			0.81								
d. I would feel worried		0.40	0.84								
Stigma clinic											
a. People would avoid you		0.84									
b. People would think you were unclean		0.86									
c. Other people would think badly of you		0.88									
d. Other people would not want to be friends with you		0.89									
e. Other people would be disgusted by you		0.90									
f. Other people would be uncomfortable around you		0.87									
Judgement											
a. You had sexual intercourse		0.52					0.72				
b. You had oral sex,		0.42					0.82				
c. Had anal sex,		0.42					0.74				
D. Had sex with lots of different people							0.72				

N=129. Retained factors =11. Number of parameters=495. Maximum likelihood estimation. Orthogonal varimax rotation. Results omitted for factor loadings <0.40.

8.6.1.4 FEASIBILITY

Initial surveys were completed within 20 minutes in the pilot study. Few (<5%) of the potential participants refused to take part in the survey. The reasons cited for non-participation related to the length of the survey.

Because participants were not being remunerated for their time in the pilot survey, we considered <10% refusal to complete as acceptable.

8.6.1.5 ITEM REFINEMENT

Following the analysis of pilot data refinements were made to survey questions. Survey items which asked participants to respond in second person (e.g. 'you would trust') were refined to ask participants to respond in the first person (e.g. 'I would trust') for consistency between items. All survey responses were reversed to rate from: strongly agree to strongly disagree (rather than from strongly disagree to strongly agree), in line with standard practise in survey responses. The general order of the survey was revised to improve the flow of the questioning, reduce fatigue and be more logical.

8.6.1.6 ITEM REDUCTION

No items were removed from the following scales: trust in clinic services, trust in online services, ability to self-test, health confidence score, shame, stigma or judgement. Items were removed from scales relating to feelings about convenience, professional support and social norms. Justification for item reduction in these scales is provided below. The refined CMS tool is presented in Table 8-4.

Convenience

Items a – e from the pilot survey were retained in the final survey. These items had high levels of item-test correlation (>0.60) (Table 8-2) and loaded on the same factor in EFA (Table 8-3). Items f (You can get other services such as contraception, advice or see you GP) and g (You can see a doctor or nurse) were removed from the scale. The decision to remove the items was based on these factors loading on a different factor in EFA and further interrogation of the theoretical basis for their inclusion. Item f related to additional services a user could access while testing in a clinic. It had lower levels of item test correlation (0.58) and loaded moderately (0.55) with items from the scale relating to the role of a health care provider during testing. This was considered theoretically conceivable as many additional services which users may access while testing require a health care provider to deliver them. Item g related to the value of a doctor to nurse. While the internal reliability of item g was relatively strong (0.66) within the convenience scale, the item loaded well (0.66) with other items from the scale measuring the value of a health care provider during testing. This was theoretically conceivable, as doctors and nurses are health care providers, therefore item g was relocated to scale relating to the value of a health care provider.

Professional Support

Items b – e from the pilot survey were retained in the final survey. These items had high levels of item-test correlation (>0.71) (Table 8-2). Items b (I like that doctors and nurses are able to give me advice that is specifically for me) and c (I like that doctors and nurses in clinics encourage me to have safe sex) loaded on the same factor in EFA (Table 8-3). While items d (It helps to have a doctor or nurse around when you're doing taking the samples for an STI test) and e (It doesn't feel right to do an STI test without a doctor or nurse to help you) loaded on a separate factor, these items were retained within the scale because they were considered theoretically important to the domain 'professional support' as they represented the additional guidance a health care provider gives during the testing procedure. Item a (When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result) was removed from the scale

and replaced with the more general item, ‘It is important that I see a doctor or nurse’ which was moved from the convenience scale to the professional support scale. Item f from the convenience scale (You can get other services such as contraception, advice or see you GP) was not included in the final ‘professional services’ scale as feedback suggested that the importance of additional services would vary between an individual’s testing activities.

Subjective norms

Items b – d from the pilot survey were retained in the final survey. These items had high levels of item-test correlation (>0.70) (Table 8-2) and had high loadings on to the same factor in EFA (>0.61) (Table 8-3). Item a was removed from the scale. This item ‘Many people like me take responsibility for our own health’ loaded moderately on two factors in EFA. The interpretability of ‘taking responsibility for one’s own health’ was brought into question by the panel of experts (described in phase two) and it was agreed that this should be removed.

Table 8-4: Refined CMS tool items and scales

Theme	Item	
Theme: Convenience	1. Thinking about getting an STI test, rate your level of agreement with the following statements (1 = strongly agree …5= strongly disagree)	
Scale: Convenience when testing	1a	It is important that I get my result quickly
	1b	It is important that I don't have to wait too long in the waiting room
	1c	It is important that I can take a test as soon as possible
	1d	It is important that I take a test at a time that suits me
	1e	It is important that I don't have to wait for an appointment
Theme: Professional support	2. Still thinking about doing an STI test, rate your level of agreement with following statements (1= strongly agree… 5= strongly disagree)	
Scale: Professional support	2a	It is important that I see a doctor or nurse
	2b	I like that doctors and nurses are able to give me advice that is specifically for me
	2c	I like that doctors and nurses in clinics encourage me to have safe sex
	2d	It helps to have a doctor or nurse around when you're doing taking the samples for an STI test
	2e	It doesn't feel right to do an STI test without a doctor or nurse to help you
Theme: Trust	3. When thinking about doing an STI test in a clinic, rate your level of agreement with following statements (1= strongly agree…. 5= strongly disagree)	
Scale: Trust in sexual health clinics	3a	I trust that the information that I receive at a clinic is accurate and up to date
	3b	I trust that any information about me is stored safely at the clinic
	3c	I trust the results are accurate from an STI test that is done in a clinic
	3d	I trust the test kits they use at the clinic are accurate
Theme: Privacy	4. Imagine if people you know saw you in an STI clinic, rate your level of agreement with the following statements (1= strongly agree…. 5= strongly disagree)	
Scale: Shame	4a	I would feel ashamed
	4b	I would feel embarrassed
	4c	I would feel guilty
	4d	I would feel scared
Scale: Stigma	5a	They would avoid you in the future
	5b	They would think you were unclean
	5c	They would think badly of you
	5d	They would not want to be friends with you
	5e	They would be disgusted by you
	5f	They would be uncomfortable around you
Theme: Privacy	6. When thinking about talking to a doctor or nurse about your sexual health, rate your level of agreement with the following statements: (1=strongly agree, 1 = strongly disagree)	
Scale: Judgement	6a	They would think less of you if you told them you had sexual intercourse
	6b	They would think less of you if you told them you had oral sex
	6c	They would think less of you if you told them you had anal sex
	6d	They would think less of you if you told them you had sex with lots of different people
Theme: Trust	7. STI testing kits are now available through online services. You can order an STI test online. The test is sent in the post to your home, you collect the samples yourself and post these back. The results are sent by text. Thinking about using an NHS online service to order STI test kits to do at home rate your level of agreement with the following statements. (1= strongly agree…. 5= strongly disagree)	

Theme	Item	
Scale: Trust in online STI testing services	7a	I would trust that the information that is on a website like this is accurate and up to date
	7b	I would trust that my data would be stored safely
	7c	I would trust the result from the test kit that is sent to me is accurate
	7d	I would trust the result if the test result was positive (that I had an infection)
	7e	I would trust the result if the test result was negative (that I didn't have an infection)
	7f	I would trust that the test kit sent is as accurate as the ones they use in a clinic
	7g	I trust that the packaging that the test kit is sent in is discrete (private)
	7h	I would trust the postal system to deliver my samples back to the lab safely
Theme: Self-efficacy to self-manage	8. Now thinking about doing an STI test at home on your own (where the test kit is sent to your house and you take the samples at home to send back to the lab), rate your level of agreement with the following statements (1= strongly agree…. 5= strongly disagree)	
Scale: self-efficacy to self-test	8a	I think I could do this test easily
	8b	I would be able to prick my finder to do the test
	8c	I would be able to do the test correctly
	8d	I would be able to find help, support or information if I got stuck
Theme: Subjective norms	9. Now thinking about your friends or people you know, rate your level of agreement with the following statements (1= strongly agree…. 5= strongly disagree)	
Scale: Subjective norms	9a	People like me would use online services for STI testing
	9b	People like me would test at home for STIs
	9c	People like me like using new health services
Theme: Self-efficacy to self-manage	10. Rate your level of agreement with the following statements, (1= strongly agree…. 5= strongly disagree)	
Scale: Health confidence scale	10a	I know enough about my sexual health
	10b	I can look after my sexual health
	10c	I can get the right help if I need it
	10d	I am involved in decisions about me

8.7 STAGE TWO

8.7.1.1 SURVEY POPULATION

Eight-hundred and seventy-seven participants took part in the main survey. Their socio-demographic characteristics and the trial arm which they were assigned to is reported in Table 8-5. Most participants were female (64.65%), aged over 20 years, identified as white (75.71%) and reported being heterosexual (78.22%). All surveys were completed online using the e-survey tool. All 877 participants completed all items therefore there was no missing data.

A sub-population of 22 participants took part in the test-retest survey. The socio-demographic characteristics of these participants are presented in Table 8-5. This population did not differ from the main survey population in their demographic characteristics (p=>0.05) (Table 8-5).

Table 8-5: Characteristics of survey participants

Characteristic	Main survey N (%)	Re-test subpopulation N (%)	P-value for difference
Gender			
Male	307 (35.01)	7 (31.82)	0.911
Female	567 (64.65)	15 (68.18)	
Transgender	3 (0.34)	0	
Age Group (years)			
16-19	101 (11.52)	1 (4.55)	0.100
20-24	373 (42.53)	6 (27.27)	
25-30	403 (45.95)	15 (68.18)	
Ethnic group			
White	644 (75.71)	17 (77.27)	0.838
Black African/Caribbean/other	77 (8.78)	3 (13.60)	
Multiple ethnic groups	76 (8.67)	1 (4.50)	
Asian	46 (5.25)	1 (4.50)	
Other	14 (1.60)	0	
Sexual orientation			
Heterosexual male	182 (20.6)	3 (13.6)	0.818
Heterosexual female	504 (57.5)	13 (59.1)	
Homosexual male	101 (11.5)	4 (18.2)	
Homosexual female	7 (0.8)	0	
Bisexual male	17 (1.9)	0	
Bisexual female	49 (5.6)	2 (9.1)	
Prefer not to say	15 (1.71)	0	
Trial arm			
Clinic	430 (49.09)	7 (31.82)	0.101
SH:24	446 (50.91)	15 (68.18)	
Total	877	22	

8.7.1.2 RELIABILITY

8.7.1.2.1 INTERNAL CONSISTENCY

Cronbach's Alpha for each scale in the revised CMS tool are presented in Table 8-6. Internal consistency was high (≥0.70) for all scales except the scale for convenience (0.58). Average inter-item correlations for all scales were acceptable (>0.20), however item redundancy remained apparent for all scales except the scale for convenience (Table 8-6). Individual item correlations are available in Appendix V.

Table 8-6: Final Tool Internal Consistency N=877

Construct	Average interitem correlation	Cronbach's Alpha
Convenience	0.22	0.58
Professional support	0.41	0.78
Trust in sexual health clinics	0.61	0.86
Shame	0.64	0.88
Stigma	0.67	0.92
Judgement	0.64	0.88
Trust in online services	0.56	0.91
Self-efficacy to self-test	0.58	0.85
Subjective norms	0.67	0.86
Health confidence scale	0.52	0.81

no missing items

8.7.1.2.2 TEST-RETEST RELIABILITY

Test re-test reliability was carried out for a subsample of 22 individuals with a 14-day interval between the first and second survey. For all scales, except the scale for subjective norms, the level of agreement between first and second survey scores was acceptable. There was excellent agreement between surveys for professional support and trust in online STI testing services, suggesting these measures are particularly stable. Although the scale for subjective norms had acceptable scale stability the p value for this scale was not significant, suggesting there was variability in the stability of this scale (Table 8-7).

Table 8-7: Lin's p^c for each scale N=22

Construct	CCC rho (Lin's p^c)	P value
Convenience when testing	0.44	0.011
Professional support	0.81	<0.001
Trust in sexual health clinics	0.57	<0.001
Shame	0.69	<0.001
Stigma	0.74	<0.001
Judgement	0.35	0.047
Trust in online STI testing services	0.82	<0.001
Self-efficacy to self-test	0.71	<0.001
Subjective norms	0.25	0.197
Health confidence scale	0.79	<0.001

CCC=concordance correlation coefficient * no missing items

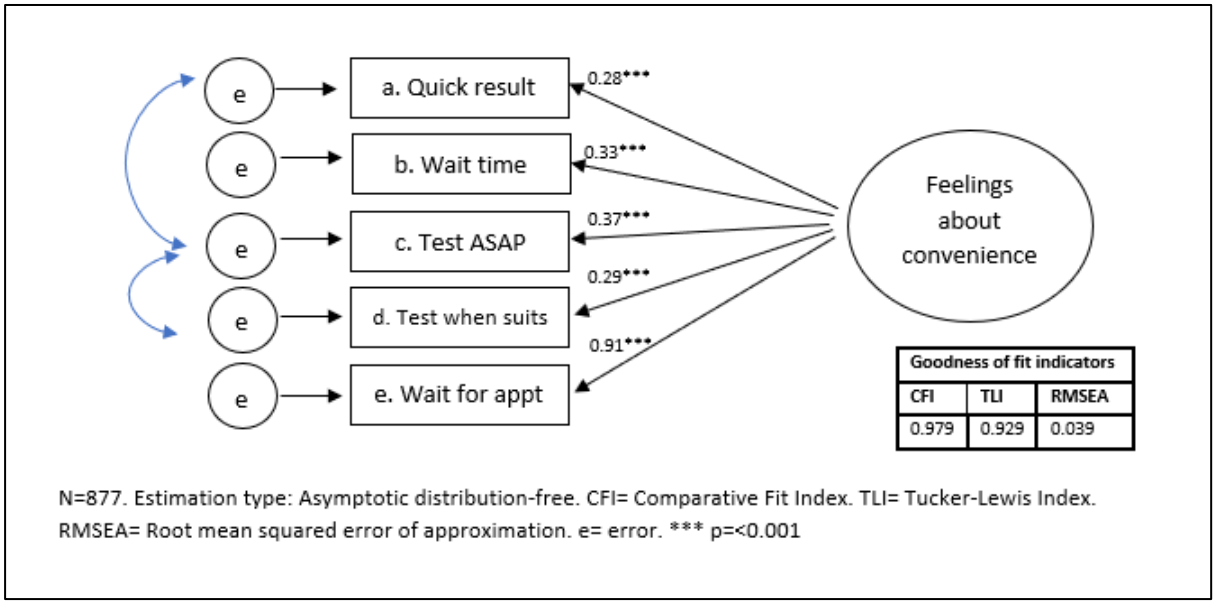
8.7.1.3 CONFIRMATORY FACTOR ANALYSIS

Factors were confirmed using structural equation modelling methods (SEM) for each scale as a single factor model. Standardised solutions for each factor model are described graphically in Figure 8.3 to Figure 8.12. SEM analysis was based on data from 877 participants of the Gettested e-survey. Post hoc modifications to error correlations were conducted for scales where modification indices suggested improvements to model fit could be made. These we considered along with theoretical reasons for error correlation between items.

Convenience

The factor model for convenience is presented in Figure 8.3. The loadings for items a-d fall below what is defined as meaningfully related to the latent variable (≥0.40). The model achieved good fit according to CFI and RMSEA values (CFI=0.979, TLI=0.929 and RMSEA=0.039). Errors were correlated between items a and c and items c and d based on modification indices and theoretically validity for correlation between items relating to timing of the test.

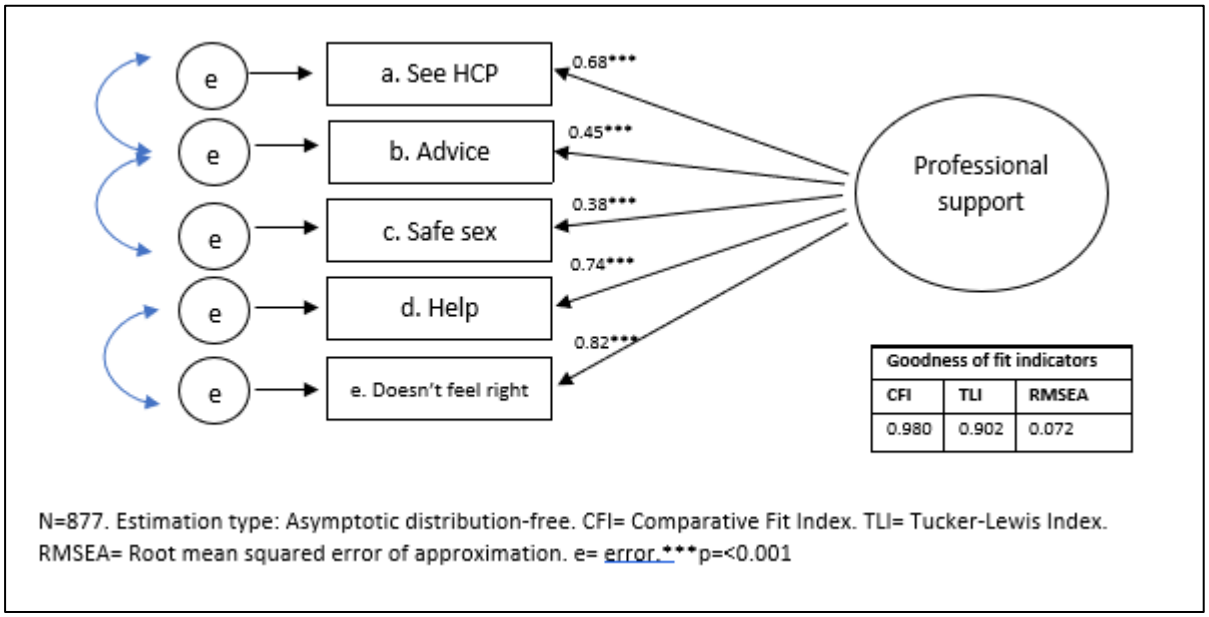
Figure 8.3: Standardised factor model solution for the scale for convenience



Professional support

The factor model solution for the scale professional support is presented in Figure 8.4. The factor loadings for items a, b d and e were meaningfully related to the latent variable (≥0.40). Item c fell below the threshold of what was meaningfully related to the latent variable. The model appears to be an acceptable fit for the data according to the CFI value, however the TLI and RMSEA values suggest the model fit could be improved (CFI=0.98, TLI=0.902, RMSEA= 0.072). Errors were correlated between observed variables a and b, b and c and d and e.

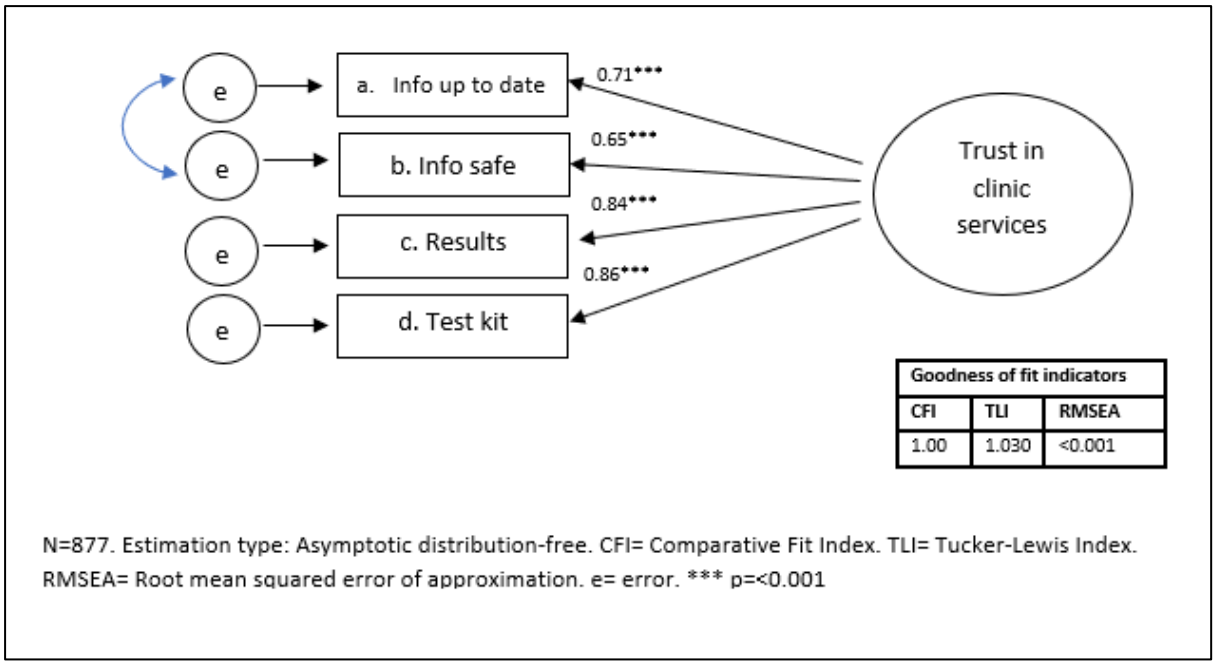
Figure 8.4: Standardised factor model solution for the scale Professional Support



Trust in Sexual Health Clinics

The factor model solution for the scale Trust in Sexual Health Clinics is presented in Figure 8.5. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=1.000, TLI= 1.030, RMSEA=<0.001). Errors were correlated between items a and b.

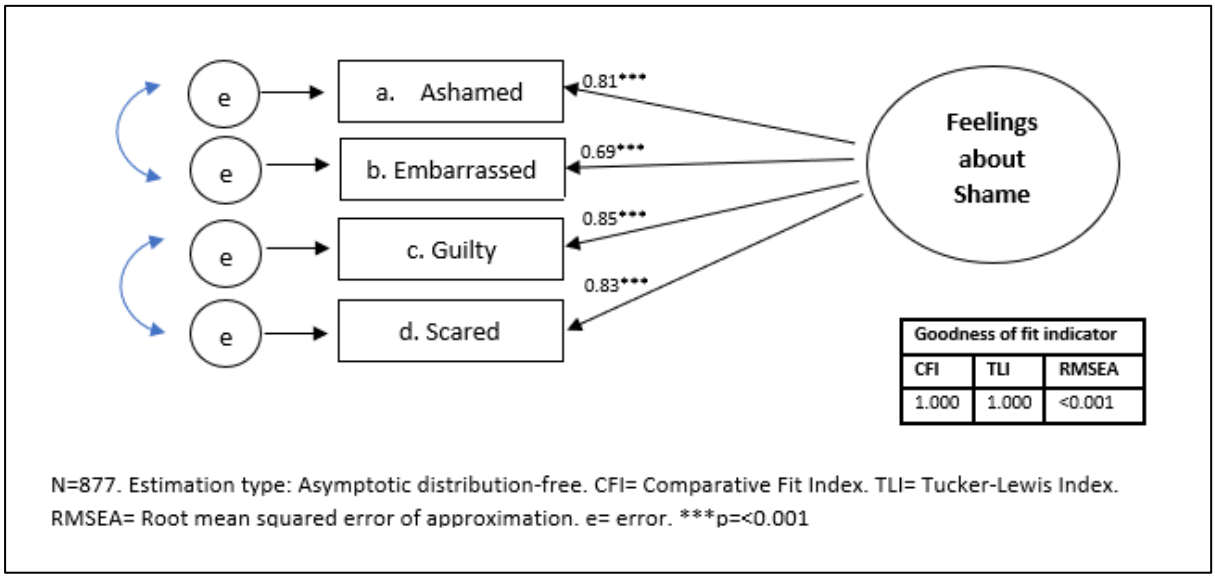
Figure 8.5: Standardised factor model solution for the scale Trust in Sexual Health Services



Shame

The factor model solution for the scale for shame is presented in Figure 8.6. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=1.000, TLI= 1.000, RMSEA=<0.001). Errors were correlated between items a and b and c and d.

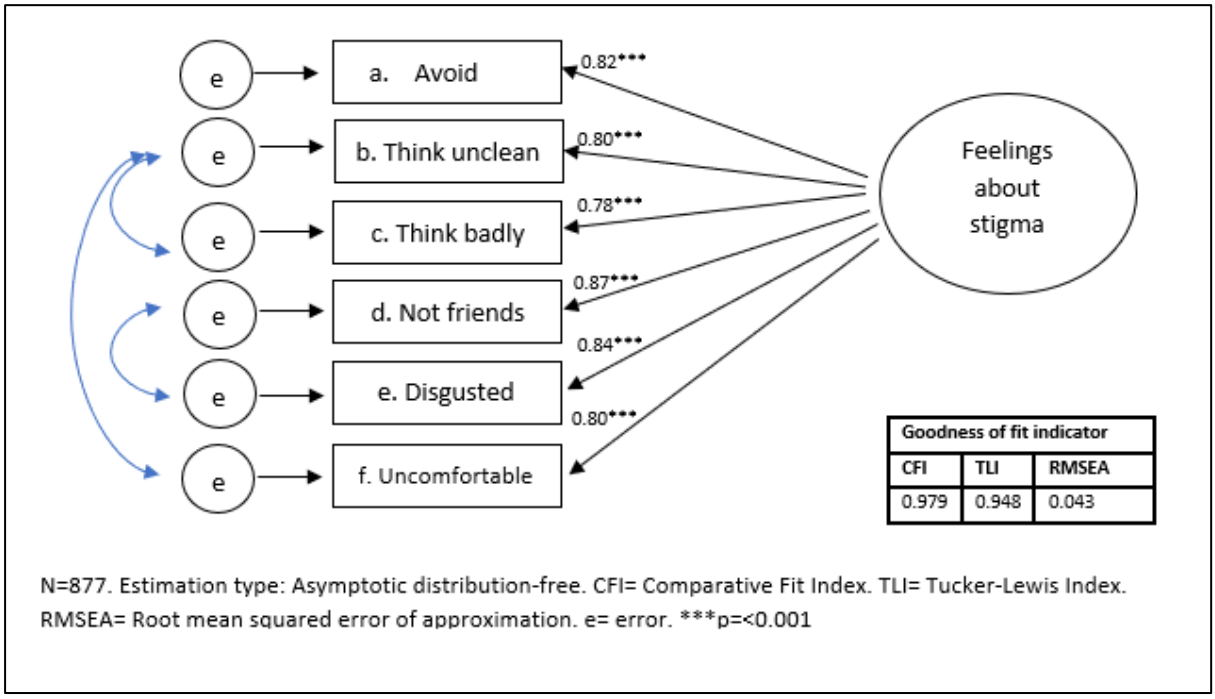
Figure 8.6: Standardised factor model solution for the scale Feelings about Shame



Stigma

The factor model solution for the scale for stigma is presented in Figure 8.7. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=0.979, TLI= 0.948, RMSEA=0.043). Errors were correlated between items b and c, items d and e and items b and f.

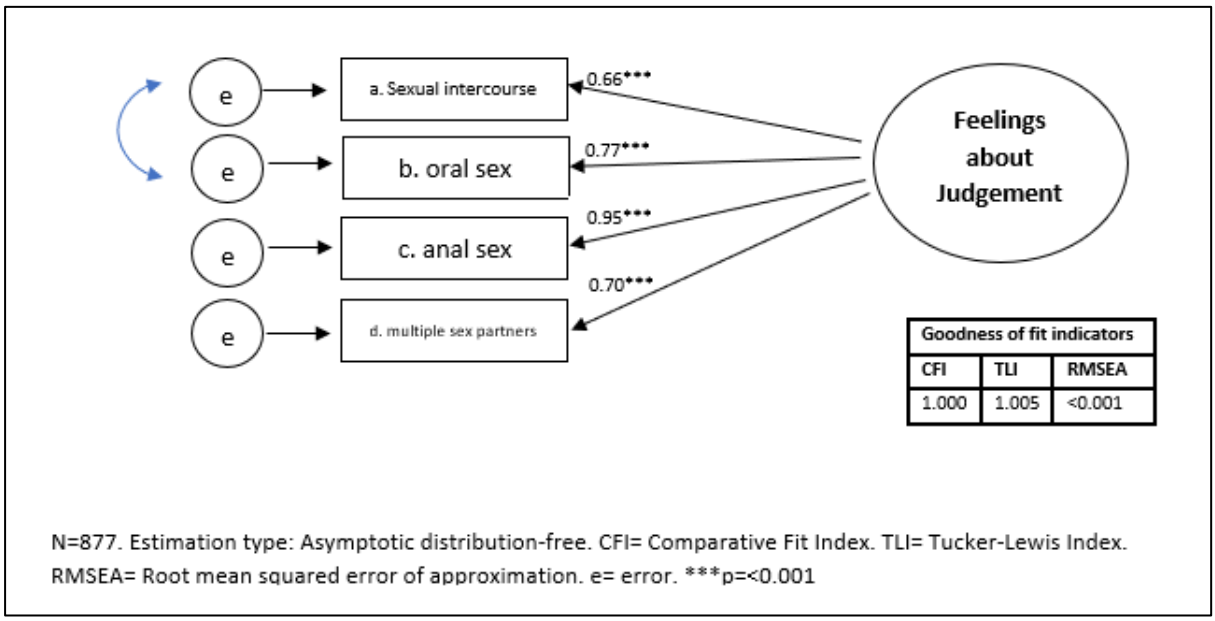
Figure 8.7: Standardised factor model solution for the scale Feelings about Stigma



Judgement

The factor model solution for the scale for Judgement is presented in Figure 8.8. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=1.000, TLI= 1.005, RMSEA=<0.001). Errors were correlated between items a and b.

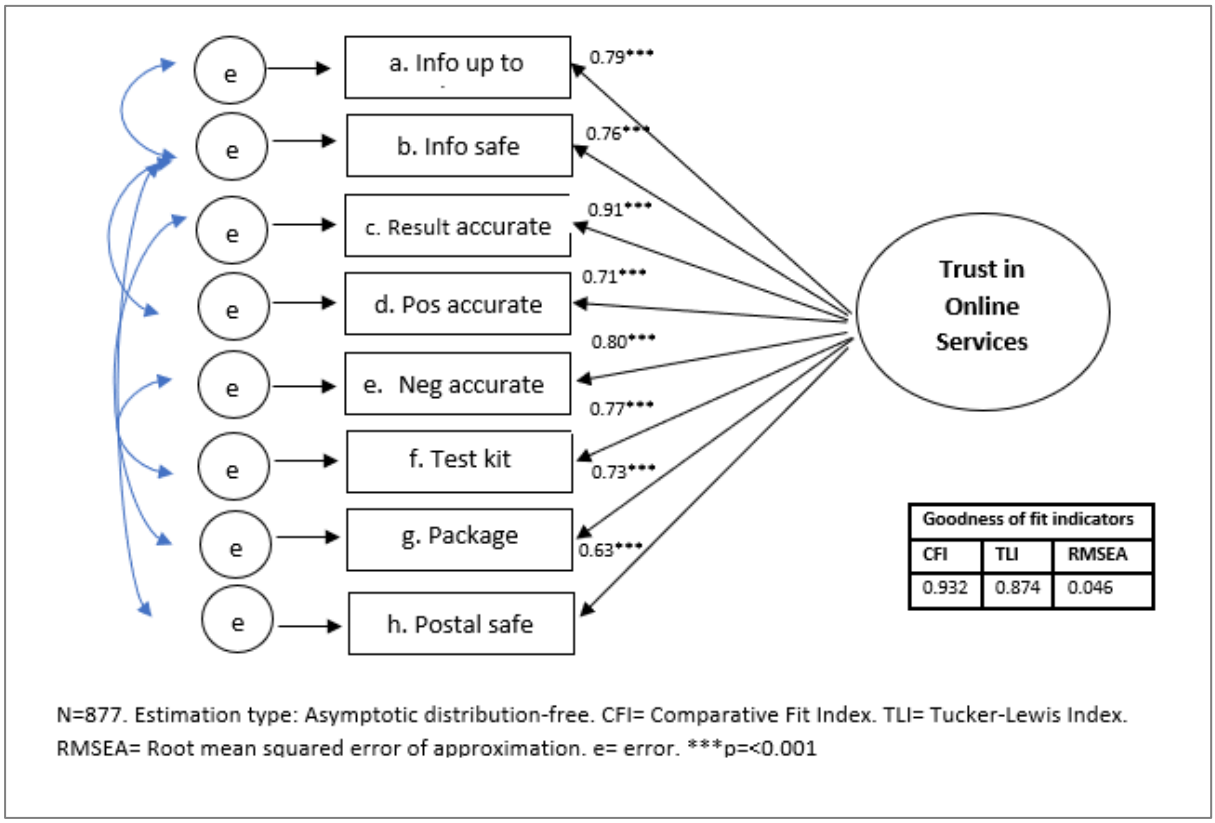
Figure 8.8: Standardised factor model solution for the scale Judgement



Trust in Online STI Testing Services

The factor model solution for the scale Trust in Online STI Testing Services is presented in Figure 8.9. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is an acceptable fit for the data according to the RMSEA, however, the CFI and TLI suggest there could be improvements to model fit (CFI=0.932, TLI= 0.874, RMSEA=0.046). Errors were correlated between items a and b, items b and d, items e and f, items b and g and items b and h.

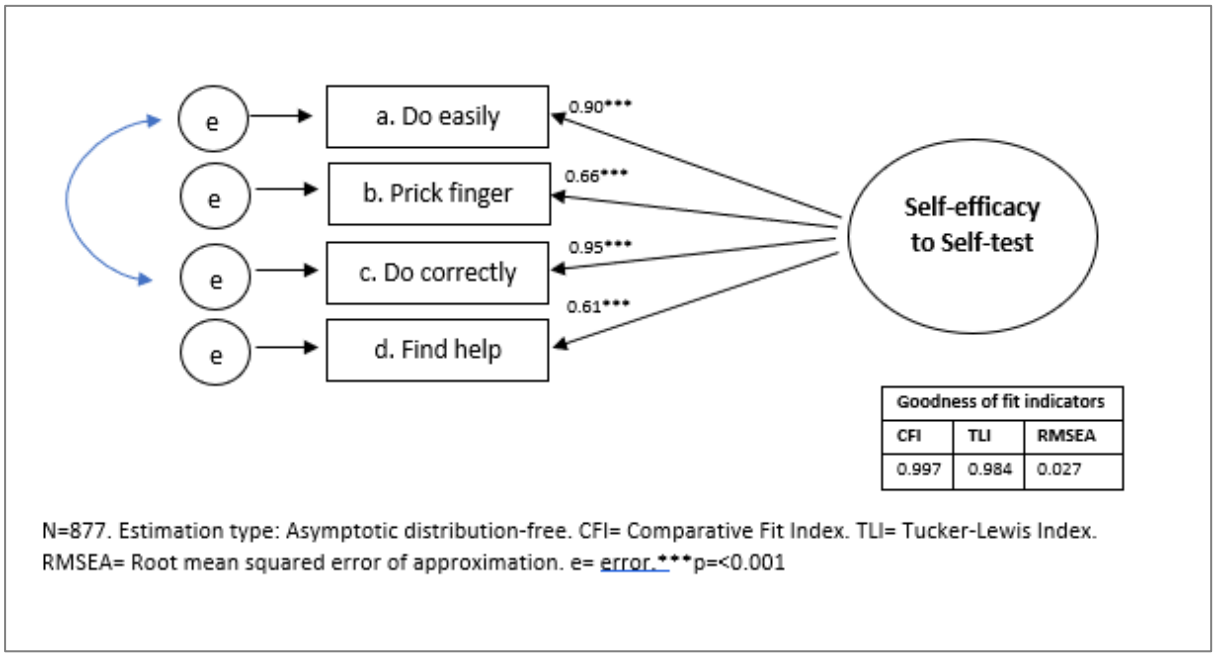
Figure 8.9: Standardised factor model solution for the scale Trust in Online STI Testing Services



Self-efficacy to self-test

The factor model solution for the scale self-efficacy to self-test is presented in Figure 8.10. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is an acceptable fit for the data (CFI=0.997, TLI= 0.984, RMSEA=0.027). Errors were correlated between items a and c.

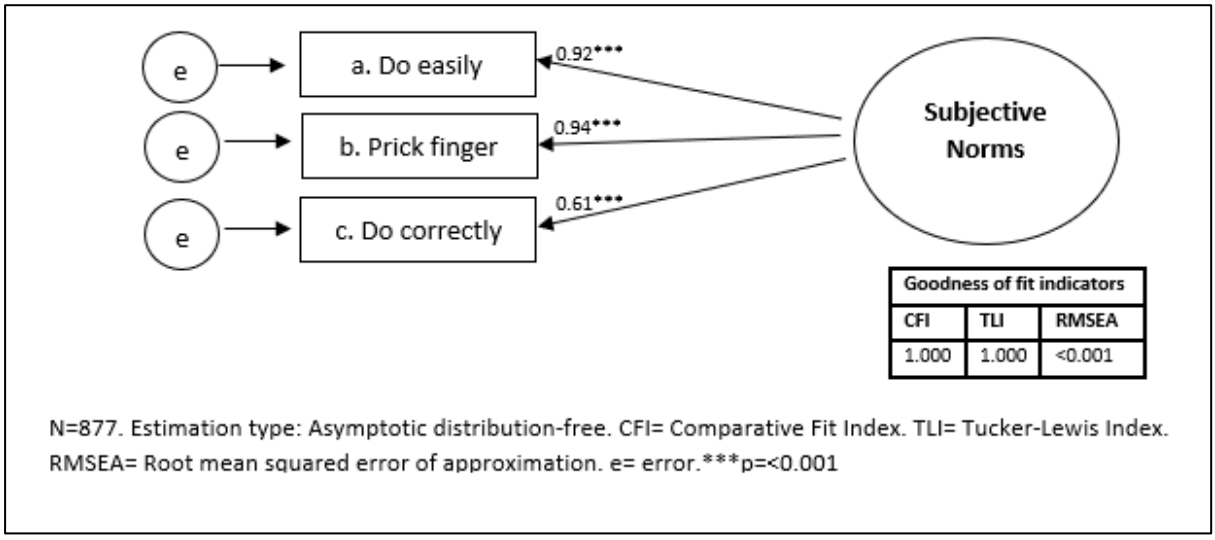
Figure 8.10: Standardised factor model solution for the scale Self-efficacy to self-test



Subjective Norms

The factor model solution for the scale subjective norms is presented in Figure 8.11. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=1.000, TLI= 1.000, RMSEA=<0.001). No post-hoc modifications were made because the model had good fit.

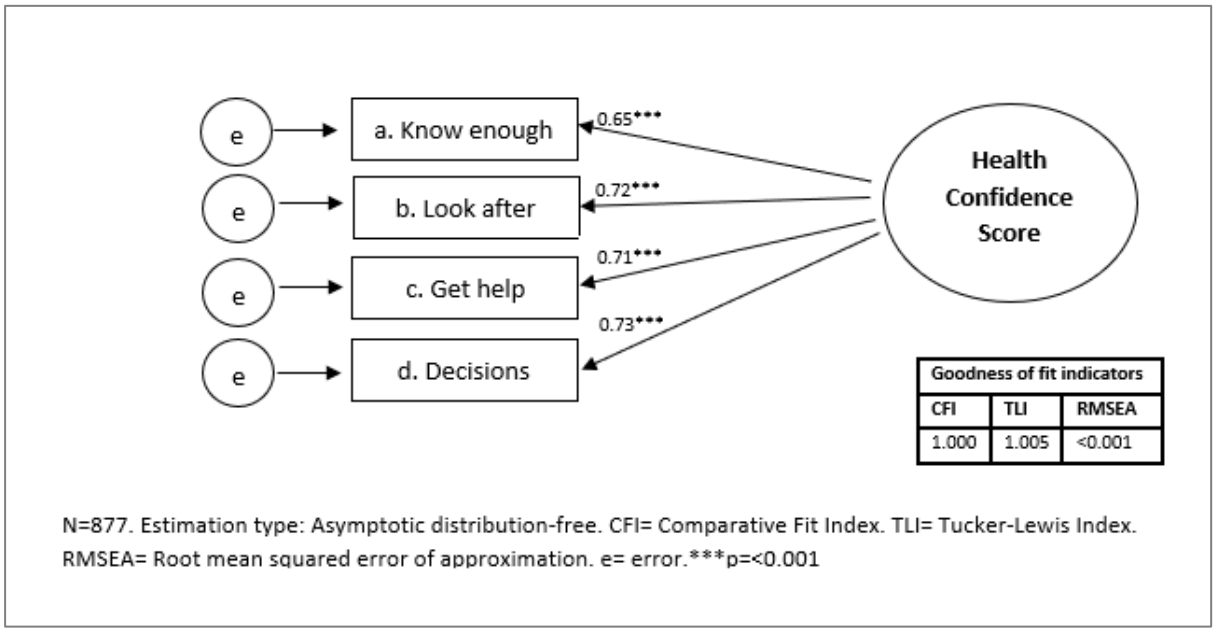
Figure 8.11: Standardised factor model solution for the scale Subjective Norms



Health Confidence Score

The factor model solution for the scale health confidence score is presented in Figure 8.12Figure 8.11. The factor loadings for each model are meaningfully related to the latent variable (≥0.40) and the model is a good fit for the data (CFI=1.000, TLI= 1.005, RMSEA=<0.001). No post-hoc modifications were made because the model had good fit.

Figure 8.12: Standardised model solution for the Health Confidence Scale



8.7.1.4 FEASIBILITY

The survey was considered as feasible because the typical completion time was < 20 minutes (5 minutes 20 seconds). Of the 1014 participants that consented and began the survey, 906 (89.34%) completed all the survey questions. Of these, 877 were not duplicates. Most participants completed the surveys on mobile phones (88.47%), while only 11.21% completed the surveys on a computer and few (0.32%) completed the survey on a tablet computer.

8.7.1.5 SUMMARY

A summary of the performance of each scale in the refined tool is presented in Table 8-8. Six out of the ten scales within the CMS met all the criteria within the psychometric evaluation. The scale for feelings about convenience when testing did not meet the criteria for internal reliability or for validity. The scale for professional support did not meet the criteria for validity. The scale for trust in online services did not meet all criteria for goodness of fit. The scale for subjective norms did not meet the criteria for test-retest reliability. The CMS met feasibility criteria.

Table 8-8: Summary of psychometric properties of each scale in the refined CMS tool

	Internal reliability	Test-retest reliability	Validity	Validity	Feasibility
Criteria	Cronbach's alpha ≥0.70	CCC rho (Lin's p^c) ≥0.20 p=<0.05	Factor loadings ≥0.40 for all items	Goodness of Model Fit	Completed survey within 20 minutes
Scale					
Convenience when testing	X α= 0.58	√	X Items ab, de <0.40	√	
Professional support	√	√	X item c <0.40	X TLI= 0.902 RMSEA= 0.072	
Trust in sexual health clinics	√	√	√	√	
Shame	√	√	√	√	
Stigma	√	√	√	√	√
Judgement	√	√	√	√	
Trust in online STI testing services	√	√	√	X CFI=0.932 TLI= 0.872	
Ability to self-test	√	√	√	√	
Subjective norms	√	X ccc=0.25 p=0.197	√	√	
Health confidence scale	√	√	√	√	

CCC= concordance correlation coefficient. X= criteria not met. √= criteria met

DISCUSSION

This chapter evaluated the psychometric properties of a series of 10 scales that reflect the factors that influence use of online services for self-sampling for STIs at home among residents of the London boroughs of Lambeth and Southwark. The scales were designed to address the need for psychometrically validated measures of the factors that influence use and non-use of online services for STI testing. Six of the 10 scales (trust in sexual health clinics, feelings about shame, stigma and judgement, ability to self-test and health confidence scale) were psychometrically robust, fully meeting reliability, validity and feasibility criteria. These scales are fit for use measuring the factors that influence use of online services for STI self-sampling at home. The scale for trust in online STI testing services was psychometrically robust, meeting criteria for reliability, validity and feasibility, however modifications to the scale could be made to improve the model fit. The scale for professional support contained one item that fell below the threshold validity, however this threshold (≥0.40) is relatively conservative and the items inclusion is supported by qualitative data. This scale could also be modified to improve goodness of fit. The scale for subjective norms is psychometrically robust, although more work is needed to establish if this is stable over time. The scale for convenience when testing requires additional development prior to use.

This study is the first of its kind to develop and psychometrically test a CMS to comprehensively measure the psychological factors associated with use of online services for STI self-sampling at home. The study evaluates reliability, validity and feasibility using a broad range of tests, in two stages, first by exploring the data and refining items, then by confirming the properties of the refined items. Factors measured within the tool are derived from data within qualitative interviews, therefore they inherently have high levels of face-validity. The sample size for stage two of the study was sufficiently large and while the sample for stage one fell below what was initially planned, factor loadings were large enough in the EFA to support the size of the sample. The study does have some limitations. The final survey was carried out among trial participants who were residents in two London boroughs, therefore results may not be fit for use among other populations. Additionally, the survey was relatively long (49 items in the refined version) and therefore participants may have fatigued, reducing the variability of responses in the latter scales. For scales relating to trust in clinic services and online services, professional support and ability to self-test, this is the first psychometric evaluation of these scales. Further evaluation among different populations could improve the scales in terms of their reliability, validity and generalisability.

The scales for stigma, shame, judgement and the HCS have been adapted from existing scales to suit the context of online services for STI self-sampling at home [277, 283, 284]. Scales for stigma, shame and judgement were developed for a study investigating perceptions of stigma, shame and judgement among adolescents seeking STI related care in the USA. The study reports Cronbach's alpha values for each scale (stigma alpha=0.80, shame alpha=0.90 and judgement alpha=0.81) from a household sample of 142 sexually active African-American young people aged 13-19 years [277]. Further psychometric analysis of the scales for stigma and shame was carried out among a household sample of young people aged 15-24 in the USA which reports high levels of validity for both scales [283]. The results from this chapter offer further psychometric evaluation, including validity of the judgement scale and test-retest reliability. These

results also confirm that these scales are psychometrically robust following adaptations and suitable for use among young people aged between 16 and 30 years in South London.

The scale for Health Confidence Score was originally developed as a short generic survey instrument to measure a patient's confidence in looking after their own health and has been subjected to more psychometric testing than other previously existing scales used in the CMS in this chapter [279, 284]. Previous analysis of this scale included three studies, two among the general public in the UK (n=1031, n=378) and one among users of social prescribing services, composed of older people in the UK (n=1325). It reported high levels of internal reliability and high level of performance when compared with longer, more established scales measuring the same construct [279]. This chapter offers additional psychometric evaluation of this scale in the context of self-sampling for STIs among young people and confirms that it is robust and fit for use in this context.

Scales relating to trust in clinic services and online services, professional support and ability to self-test were derived from qualitative interview data for the purpose of evaluating access to online services for STI self-sampling among residents of the London boroughs of Lambeth and Southwark. This is the first study to assess the psychometric properties of these recently developed scales. The results of this chapter suggest that these scales are fit for purpose among these populations. However, scales for trust in online services and professional support should undergo further improvements to improve model fit. These improvements could involve a review of the number and the selection of items used in the scale [311].

The five-item scale for feelings about convenience when testing did not meet reliability and validity criteria in the revised survey and therefore requires further development. Revisions to the scale weakened its psychometric properties. A reduction in alpha value following removal of items from the scale was expected, however, the results from CFA suggest this scale may contain items that are not related to the overall theme of convenience. Further work is needed to theoretically define what is meant by feelings about convenience when testing, and how sensitive this is to perceptions of risk at the time of testing. In the scale's current form, this scale is not fit for purpose. However, analysis can be carried out at the item level, rather than as a scale, so long as researchers acknowledge the potential for random measurement error in analysis of single items [315].

The three-item scale for subjective norms did not meet criteria for test-retest reliability. It is possible that the survey itself influenced a participant's perceptions of subjective norms. In qualitative interviews, participants reported that the interviews themselves made them feel that the online service was more normal (Chapter 6). It is also possible that the relatively short length of this scale (three items), and therefore the relative importance of each score makes it more vulnerable to variations in scores between the first and second survey. The scale is fit for purpose in terms of reliability and validity, however further test-retest reliability should be carried out on this scale to establish the stability of the scale.

This chapter, along with its two predecessors developed and evaluated the psychometric properties of a CMS designed to measure the barriers and facilitators to use of online services for STI self-sampling at home. Eight scales in the CMS relating to the professional support, trust in sexual health clinics, shame, stigma and judgement, trust in online STI testing services, ability to self-test and health confidence are reliable, valid and feasible for use in assessing the use of online services for self-sampling at home. The scale for subjective norms is valid and has good internal reliability, however this scale lacks stability reliability.

These nine scales are appropriate for use in this thesis, and for future investigations into barriers and facilitators to use of online services for STI self-sampling at home. One scale, relating to convenience when testing for STIs is, in its present state, not fit for use and therefore should not be analysed as a scale, however, item level analysis is appropriate. Further work is required to establish the theoretical properties of the theme for convenience when testing. Future work on the nine validated scales should continue to assess the quality of the scales by repeating the same tests among different populations and applying additional tests of hypothesis to establish convergent and divergent validity.

Chapter 9 QUANTITATIVE INVESTIGATION OF THE FACTORS ASSOCIATED WITH THE USE OF ONLINE SERVICES FOR STI SELF-SAMPLING AT HOME: IMPLEMENTING THE CMS

INTRODUCTION

This final results chapter is the culmination of the investigation into access to online services for STI self-sampling at home. It uses the composite measurement scale (CMS) tool developed in the previous chapters to investigate the barriers and facilitators to use of online services for STI-self-sampling at home. It investigates how individual factors influence realised access (use) among a group of people who have received equal information about online services for STI testing. Two types of analyses are carried out. The cross-sectional analyses investigate factors that relate to the individual who is testing. The repeated measures analysis investigates the extent to which factors that are highly variable between testing episodes influence whether an individual accesses STI testing using an online or face-to-face service. In the discussion, the importance of these findings will be discussed in relation to the wider literature. It will then go on to adapt the theoretical model produced in Chapter 6 to incorporate the findings of this chapter. The discussion in Chapter 10 will then place these findings within the wider findings of the thesis and discuss the them in relation to equity of access.

AIMS

To investigate how the barriers and facilitators to use of online services for STI self-sampling at home that were identified in Chapter 6 influence use of online services for STI testing compared to face-to-face testing.

METHODS

A STORBE [219] checklist is available in Appendix Z.

9.1 STUDY SETTING

This study is set in the London boroughs of Lambeth and Southwark. Detailed information about the study setting can be found in Chapter 4. The study examines access to SH:24, an online service for STI self-sampling at home. Detailed information about the service can be found in Chapter 4. Participant information and consent is available in Appendix W and X.

9.2 STUDY PARTICIPANTS

The study population draws from participants of the Gettested Trial. The Gettested Trial was a separate study completed among the residents of Lambeth and Southwark in 2015. More information about the Gettested Trial is available in Chapter 4. All participants that took part in the Gettested Trial who were allocated to the intervention arm and indicated that they were willing to take part in future research were invited to take part in the survey (n=706)[316]. Participants in the intervention arm received a text message to encourage them to use online services for STI testing at home, therefore all participants were given equal information about the online service [316]. Follow up for the trial was completed in November 2015.

In August 2016, participants from the intervention group of the trial, who were willing to take part in further research were invited to take part in the survey via text message and email. The text message and email contained a link to study information and consent online.

9.3 STUDY DESIGN

This chapter presents a retrospective repeated cohort study of self-reported STI testing activity. The study consisted of two surveys, the e-survey and the tele-survey. The e-survey consisted of the composite measurement scale (CMS) designed and tested in Chapters 6, 7 and 8 of this thesis. The CMS collected data on factors relating to individual level at the time of testing. Research assistants then aimed to telephone participants within two weeks of e-survey completion to carry out the tele-survey. The tele-survey collected data relating to place of test for each testing activity in the two years following completion of the Gettested Trial. The tele-survey also collected data relating to the individual's circumstances at the time of each test that the participant reported taking, retrospectively. Data from the e-survey and tele-survey were linked to demographic baseline data from the 'Gettested Trial' using participant identification number (ID).

9.3.1.1 STUDY OBJECTIVES

The overall objective of this exploratory research was to identify the factors that are associated with use of online services compared to face-to-face services for STI testing. Each individual factor that was identified as a barrier or facilitator to access in Chapter 6 was investigated individually. Because some of these factors varied for individuals between each testing activity, two types of analyses were carried out; a cross-sectional analysis to investigate the factors that were less subject to variation between testing activities and; a longitudinal analysis to investigate the factors that could vary between testing activities. The cross-sectional analysis investigates the influence of trust, subjective norms, self-efficacy to self-test, health confidence, professional support, stigma, shame, judgement and convenience on type of service used to test for most recent testing episode. It uses data from the Gettested Trial and data from the e-survey.

Objective 1: To investigate the influence of trust, subjective norms, self-efficacy to self-test, health confidence, professional support, stigma, shame, judgement and convenience on use of online services for STI self-sampling at home compared to face-to-face services for STI testing for most recent test. Table 9-1 details the objective and hypothesis for each of these factors.

Table 9-1: Specific objectives and hypotheses for the investigation of the influence of the factors that influence use of online services for STI self-sampling at home for the last test.

	Sub-objective	Hypothesis
1.1.	To determine how **trust in online services** is associated with use of online services compared to face-to-face services for STI testing.	Participants who have higher levels of trust in online services are more likely to use online services for STI testing.
1.2.	To determine how **trust in face-to-face services** is associated with use of online services compared to face-to-face services for STI testing	Participants who have higher levels of trust in face-to-face services are more likely to use online services for STI testing
1.3.	To determine how **subjective norms** around testing are associated with use of online services compared to face-to-face services for STI testing.	Participants who consider online testing more normal are more likely to use online services for STI testing
1.4.	To determine how **self-efficacy to self-test** is associated with use of online services compared to face-to-face services for STI testing.	Participants who have higher levels of self-efficacy are more likely to use online services for STI testing.
1.5.	To determine how **health confidence** is associated with use of online services compared to face-to-face services for STI testing.	Participants who have higher levels of health confidence are more likely to use online services for STI testing.
1.6.	To determine how a preference for **professional support** is associated with use of online services compared to face-to-face services for STI testing	Participants with higher preference for professional support during testing are more important are less likely to use online services for STI testing.
1.7.	To determine how perceptions of **stigma** are associated with use of online services compared to face-to-face services for STI testing.	Participants who perceive higher levels of stigma about testing are more likely to use online services for STI testing.
1.8.	To determine how **shame** is associated with use of online services compared to face-to-face services for STI testing.	Participants who experience more shame about testing are more likely to use online services for STI testing.
1.9.	To determine how feelings about **perceived judgement** are associated with use of online services compared to face-to-face services for STI testing.	Participants who perceive higher levels of judgement from health care providers are more likely to use online services for STI testing.
1.10.	To determine how **preferences for convenience** are associated with use of online services compared to face-to-face services for STI testing	Participants who feel high levels of convenience are important during testing will be more likely to use online services for STI testing compared to face-to-face services

The longitudinal analysis investigates the influence of perceived risk of infection, perceived type of infection, ease or difficulty attending a clinic, ease or difficulty of receiving a package in the post and previous use of online services on type of service used to test for each testing episode within the study period. It also describes participants' use of online and face-to-face services over time. It uses data from the Gettested Trial, the e-survey and the tele survey.

Objective 2: To investigate the influence of perceived risk of infection, perceived type of infection, ease or difficulty attending a clinic, ease or difficulty of receiving a package in the post and previous use of online services on use of online services for STI self-sampling at home, compared to face-to-face services for testing for each testing episode. Table 9-2 details the objective and hypothesis for each of these factors.

Table 9-2: Specific objectives and hypotheses for the investigation of the influence of factors that vary between testing episodes on use of online services for STI self-sampling at home, compared to face-to-face services.

Sub-objective		Hypothesis
2.1.	To determine how **difficulty in attendance to a face-to-face service is** associated with use of online services compared to face-to-face services for STI testing episodes.	Participants who find attendance to face-to-face services easier will be less likely to use online services for STI testing compared to face-to-face services.
2.2.	To determine how **difficulty in receiving a package in the post** associated with use of online services compared to face-to-face services for STI testing episodes.	Participants who find receiving a package in the post easier will be more likely to use online services for STI testing compared to face-to-face services.
2.3.	To determine how **perceived risk of infection** is associated with use of online services compared to face-to-face services for STI testing.	Participants with lower perceived risk of infection will be more likely to use online services for STI testing compared to face-to-face services.
2.4.	To determine how **perceived type of infection** is associated with use of online services compared to face-to-face services for STI testing episodes.	Participants who perceive themselves to be at risk of HIV infection will be less likely to use online services for STI testing compared to face-to-face services.
2.5.	To determine how **previous use of online services** is associated with use of online services compared to face-to-face services for STI testing episodes.	Participants who have previously used online services will be more likely to use online services for STI testing compared to face-to-face services.

Objective 3: To describe **use of STI testing services over time** among users who have been invited to use the online service, including reasons for non-use of services.

9.3.1.2 DATA SOURCES

Surveys were used to collect data from individuals because many of the factors identified as influencing access to online services for STI testing in Chapter 6 were unobservable, latent factors, for which no other method of measurement was available. Data from the e-survey and tele-survey were linked to Gettested Trial data by participant ID to obtain further information on participant characteristics.

9.3.1.2.1 SURVEY DATA

The surveys were carried out between 11th August 2016 and 24th December 2016. A series of three emails and three text message invitations were sent to the 706 Gettested Trial participants from the intervention arm that had indicated that they would be willing to take part in future research. Of the 706 participants that were eligible to take part, 446 (63.17%) agreed to take part and completed both the e-survey and the tele-survey.

The e-survey contained 44 items, contributing to nine multiple item scales relating to barriers to use of online services for STI self-sampling at home and five single item questions relating to preferences for convenience. These items were deemed suitable for self-administration in pilot studies reported in Chapter 8. Survey responses were given on a five or ten-point Likert scale. Participants responded to each survey item in relation to their views at the time of survey completion and not in relation to a specific testing activity.

The tele-survey contained items that related to specific testing activity. These required a research assistant to administer the items to ensure clarity of interpretation. Participants that had completed the e-survey were

telephoned by a research assistant who was blinded to the study hypotheses. Research assistants aimed to contact participants to complete tele-surveys within two weeks of e-survey completion. Of the 446 participants that completed the e-survey, 431 (96.41%) completed the tele-survey and 243 reported testing at least once since they participated in the Gettested Trial (Figure 9.1).

The tele-survey contained questions relating to testing activity following trial participation, and for each testing event, convenience of using a face-to-face service at the time of testing, convenience of receiving an STI testing kit in the post at the time of testing, perceived type of infection and perceived risk of infection at the time of testing. These questions were asked over the phone to increase clarity of questioning for each testing activity. Participants that took part in both the e-survey and the tele-survey received £10 remuneration by the post.

9.3.1.2.2 DATA FROM THE GETTESTED TRIAL

The Gettested Trial dataset was obtained for the purpose of this study. The dataset contained individual data for demographic characteristics of participants that was collected at baseline. These included age, gender, sexual orientation, ethnicity and place of the most recent STI test. The dataset also included the trial outcome data for self-reported service use at six weeks following randomisation categorically as either no test, tested online or tested in a face-to-face service.

9.3.1.3 INCLUSION AND EXCLUSION CRITERIA

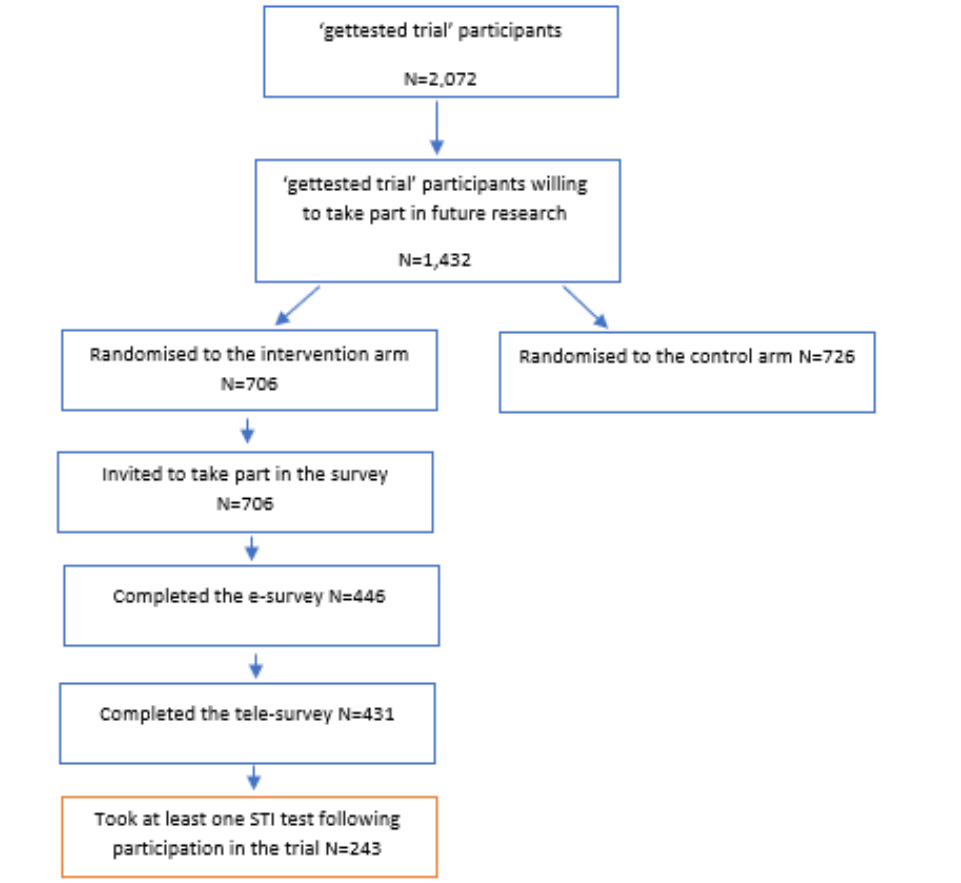
Participants were included if they:

- Were randomised to the intervention arm of the Gettested Trial
- Completed follow up of the Gettested Trial
- Took at least one STI test following their participation in the Gettested Trial
- Completed the e-survey
- Completed the tele-survey

Participants were excluded if they:

- Were randomised to the control arm of the Gettested Trial
- Did not complete follow up of the Gettested Trial
- Did not take an STI test following their participation in the Gettested Trial
- Did not complete the e-survey
- Did not complete the tele-survey

Figure 9.1: Study Flow Chart



9.3.1.4 SAMPLE SIZE

Because the population from which the sample could be taken was limited to 706 participants and the proportion of those who had tested following trial participation was unknown, the study aimed to recruit as many of the population as possible. Sample size calculations were carried out during study development to ensure multivariable and multivariate analyses were feasible. These are available in Appendix Y.

9.4 MAIN OUTCOME

The main outcome of the study was place of test for each testing activity. This was self-reported during the tele-survey. Participants were asked, 'since the trial, how many times have you had an STI test?' If they answered at least once, they were asked, for each time, where they tested and the month and year that they tested. A binary outcome of 'online test' or 'face-to-face test' was derived from the responses. Testing activity in sexual health services and GP surgeries was categorised as 'face-to-face' testing. All online testing, using the SH:24 service or any other online service for STI testing was categorised as 'online'.

The outcome for the cross-sectional analysis was the place (online or face-to-face service) of most recent testing activity to survey completion.

The outcome for the longitudinal analysis was place (online or face-to-face) of each testing for each test following trial participation.

9.5 CO-VARIATES

The exposure variables that were investigated were those identified as barriers to accessing online services in qualitative interviews in Chapter 4. In Chapters 5 and 6, a CMS was developed and psychometrically tested to measure these barriers. It consisted of nine multi-item scales measuring trust in online and face-to-face services, social norms, self-efficacy, health confidence, professional support, stigma, shame, judgement; and five single items measuring preferences for convenience. To capture individual factors that varied between testing activities perceived risk of infection, perceived type of infection, difficulty in attending a face-to-face service and difficulty in receiving a package in the post were measured for each test taken following trial participation via a tele-survey. The CMS is available in Table 8-4 and the telesurvey script is available in Appendix Y.

In addition, data for age, gender, sexual orientation, ethnic group and IMD quintile (national) were obtained from the Gettested Trial baseline data. Age in years on the date of the telesurvey was derived from date of birth and the date of the telesurvey. Gender and sexual orientation were self-reported categorical variables analysed as they were collected within the Gettested Trial. An ethnic group variable was derived from the groups collected in the trial data with the aim of generating fewer categories while representing the largest ethnic groups in the boroughs. IMD quintile was considered at LSOA level [26]. These were linked survey data via participant ID. Further description of covariates is available in Appendix DI.

9.6 STATISTICAL ANALYSES

All analyses were conducted with the use of STATA 14.1 (Stata Corporation, College Station, Texas, USA) [301].

Non-normality of continuous variables was checked by visual inspection of distribution; parametric tests were chosen for normal distributions and non-parametric tests were chosen to account for skewed distributions. Scale data were summarised using the sum of item scores. To investigate relationships between co-variates and the outcomes, bivariate associations were investigated using Wilcoxon rank-sum tests, unadjusted linear regression and Chi square tests were used. p values were two-tailed with an accepted significance level of 0·05 and p=<0.1 considered as borderline significant [227].

9.6.1.1 CROSS-SECTIONAL ANALYSIS

Binary logistic regression was performed to examine the strength of cross-sectional associations between each individual factor and place of test for most recent test. First, unadjusted logistic regression was performed to explore potential associations between the exposure variable and the outcome. Then, multivariable logistic regression was performed to examine the strength of these associations, controlling for confounding. Confounding variables were selected for inclusion in multivariable models using the two-step process described below.

Binary logistic regression models were employed because the outcome variable was binary (use of online services or use of face-to-face services) and there were multiple exposure variables. The model assumes that the observations are independent of each other and the exposure variables are not highly correlated with each other [228]. The data met these assumptions because individuals were independent from one

another and the correlation between demographic variables and the factors under investigation was low. It produces probabilities on the log scale and requires linearity of exposure variables and log odds. The results of logistic regression are expressed as odds, which have been anti-logged back to the original scale.

Effect modification between age, then ethnic group and each exposure variable that was significantly associated with use of online services in multivariate analysis was investigated using two-way factor interaction terms. Due to the relatively small sample size, variables were regrouped into fewer categories when investigating interaction. No evidence of interaction was found.

A small proportion of exposure data (n=16) was missing at random therefore complete case analysis was carried out.

9.6.1.2 LONGITUDINAL ANALYSIS

Random intercept multilevel logistic regression was performed to examine the strength of longitudinal associations between each individual factor affecting service use and place of test and to account for the repeated observations of the same individual in the sample. Because the data was hierarchical, with observations at level 1 (testing activity) nested in level 2 (individual), multilevel modelling was required to adjust for correlation between outcomes for individuals. Additionally, observations were unbalanced because the number and timing of testing differed between individuals. Generalised Linear Latent and Mixed Models (GLLAMM), a class of multilevel latent variable models that are appropriate for use when observations are unbalanced were selected to account these factors [317]. The Generalised Linear Latent and Mixed Models *GLLAMM* command was used in STATA14 [317-319].

First, unadjusted multilevel models were built to explore potential associations between the exposure variable and the outcome of place of test. Then, multivariate multilevel models were built to examine the strength of these associations, controlling for confounding. Confounding variables were selected for inclusion in multivariate models using the two-step process described below.

A small proportion of missing data (n=3) was observed in our dataset and therefore complete case analysis was carried out.

9.6.1.3 SELECTION OF CONFOUNDING VARIABLES

Because the aim of both analyses was explanatory, individual regression models were built to test one exposure variable at a time [320]. Demographic variables for age, gender, sexual orientation and ethnic group were included in all multivariable models as a *priori* cofounders based on their theoretical association with the exposures and empirical evidence of an association with the outcome, presented in Chapter 3. Dummy variables for gender (female/not female), sexual orientation (heterosexual/not heterosexual) and ethnic group (white British/not white British) were derived for inclusion in GLLAM models because factor variables were not permitted [317].

Other potential confounders were identified using a two-stage process. First, theorised causal relations among variables were identified as potentially important confounders using data from qualitative interviews (Chapter 6) and existing literature [321]. The justification for these theoretical associations is available in

Appendix AI. Then, for each exposure variable, the potential theoretical confounders were statistically examined for association with the outcome. Potential confounders associated with the outcome variables (p=<0.15) were subsequently examined for an association (p=<0.15) with the exposure being tested [227]. Those associated (p=<0.15) with both the outcome variable and the factor of interest were included in subsequent multivariable regression analysis. The statistical relationships between co-variates are presented in Appendix BI.

9.6.1.4 WEIGHTING

Inverse probability weighting was used to adjust for disproportionate sampling of gender and ethnic group relative to the populations of Lambeth and Southwark. Because the sample consisted of an unequal proportion of participants from Lambeth and from Southwark, and these boroughs have different proportions of gender and ethnic group, a two-step weighting procedure was employed. First, weights for gender and ethnic group were derived for each borough. These were then applied proportionally, based on 60% of participants coming from Southwark and 40% of participants from Lambeth.

RESULTS

A total of 431 participants completed both the e-survey and the tele-survey. The average completion time for the e-survey was 5 minutes 20 seconds and most tele-surveys took less than 10 minutes to complete. Of the 431 participants that completed the tele-survey, 243 (56.38%) tested at least once following the trial. There were some differences between those that did not test and those that tested following trial participation. A higher proportion of those that tested were homosexual or bisexual males and females (p=0.003) compared to those that did not test. Additionally, a lower proportion of those that tested were white British or white other (p=0.016). Of the 188 that did not test following participation in the trial, 164 (87.23%) cited not needing to test as a reason for not testing. The remaining 24 participants did not test because they did not have time, or did not want to, however two participants cited that they were too embarrassed to test. Appendix CI contains more information about the 431 participants that completed the telesurvey.

9.7 CROSS-SECTIONAL ANALYSIS

Table 9-3 presents the characteristics of the 243 participants that tested at least once following participation in the trial. Of these, 79 (32.51%) tested using an online service and 164 (67.49%) tested using a face-to-face service for their most recent test. The mean age of participants was 24.99 years. The majority of those that tested were female (66.67%), 74.04% were heterosexual and 72.31% were white British. Those that tested predominantly lived in areas which were ranked amongst the most deprived (34.57%) or second most deprived (45.68%) wealth quintiles nationally. More than half of the participants (63.79%) had used the online service during the trial. At the time of their most recent test, participants reported finding attendance at a face-to-face service as neither easy nor difficult (median=5) and receiving a package at home as extremely easy (median=1). Their perceived risk of infection at the time of testing was relatively low (median=3), and only 20 (8.23%) participants perceived themselves to be at risk of HIV infection.

Participants that tested online and those that tested in face-to-face services were similar in terms of characteristics. There were no significant differences in age (p=0.157), gender (p=0.655), sexual orientation (p=0.982), or IMD quintile (p=0.418) between users of online services and users of face-to-face services. The majority (86.08%) of those that tested in an online service had used the online in the past while 59.51% of those that used a face-to-face service had previously used an online service (Table 9-3). Participants that tested using the online service found attending a face-to-face service more difficult than those that tested using a face-to-face service (p=<0.001). Receiving a package at home was easier for those using the online service (p=<0.001). Perceived risk of infection and perceived risk of HIV infection was not significantly different between online users and face-to-face users.

Table 9-3 Characteristics of Participants that tested at least once following participation in the trial N=243

Covariate	Tested for an STI at least once following trial n (% unless stated otherwise)	Tested Online most recent test n (%)	Tested in Face - to-face service for most recent test n (%)	P-value
Age in years (mean SD)	Mean: 25.0 SD: 3.4	25.28 (3.2)	24.66 (3.4)	0.176
Gender				
Female	162 (66.7)	55 (69.6)	107 (65.2)	0.655
Male	79 (32.5)	23 (29.1)	56 (34.2)	
Transgender	2 (0.8)	1 (1.3)	1 (0.6)	
Sexual Orientation				
Heterosexual male	38 (15.8)	11 (14.1)	27 (16.7)	0.982
Heterosexual female	142 (58.9)	49 (62.8))	93 (57.4)	
Homosexual male	35 (14.5)	10 (12.8)	24 (14.8)	
Homosexual female	2 (0.8)	1 (1.3)	1 (0.6)	
Bisexual male	4 (1.7)	1 (1.3)	3 (1.9)	
Bisexual female	17 (7.1)	5 (6.4))	12 (7.4)	
Prefer not to say	3 (1.2)	1 (1.3)	2 (1.2)	
Ethnic group				
White British	146 (60.1)	53 (67.1)	93 (56.7)	0.852
White other	30 (12.4)	8 (10.1)	22 (13.4)	
Black African	13 (5.4)	3 (3.8)	10 (6.1)	
Black Caribbean	14 (5.8)	4 (5.1)	10 (6.1)	
Mixed white/black African or Caribbean	11 (4.5)	4 (5.1)	7 (4.3)	
Black other	3 (1.2)	1 (1.3)	2 (1.2)	
South Asian	3 (1.2)	1 (1.3)	2 (1.2)	
Any other group	23 (9.5)	5(6.3)	18 (11.0)	
IMD Quintile				
1 (most deprived)	84 (34.6)	26 (32.9)	58 (35.4)	0.418
2	111 (45.7)	36 (45.6)	75 (45.7)	
3	44 (18.1)	16 (20.3)	28 (17.1)	
4	3 (1.2)	0 (0.0)	3 (1.8)	
5 (least deprived)	1 (0.4)	1 (1.3)	0 (0.0)	
Tested online prior to trial				
No	77 (31.8)	11 (13.9)	66 (40.5)	**<0.001**
Yes	165 (68.2)	68 (86.1)	97 (59.5)	
Difficulty in attendance at a face-to-face service Median summary score (IQR)*	5 (3,7)	7 (5,8)	4 (2,6)	**<0.001**
Difficulty in receiving a package in the post Median summary score (IQR)*	1 (1,2)	1 (1,1)	1 (1,2)	**<0.001**
Perceived risk of infection Median summary score (IQR)+	3 (1,6)	3 (2,5)	4 (1,6.5)	0.099
Perceived HIV infection n (%)				
No	223 (91.8)	74 (93.7)	149 (90.9)	0.454
Yes	20 (8.2)	5 (6.3)	15 (9.2)	
Total	**243**	**79 (32.5)**	**164 (67.5)**	

IMD= index of multiple deprivation, SD = standard deviation, IQR= interquartile range. *Possible range 1-10 ranging from extremely easy to extremely difficult +Possible range 1-10 ranging from extremely unlikely to extremely likely

Table 9-4 Cross-sectional associations of trust in face-to-face services, trust in online services, subjective norms, self-efficacy, health confidence, professional support, stigma, shame and judgement, and specific items relating to convenience on use of online N=243

Barrier to accessing services	Possible range *	Most recent test N=243 median (IQR)*	Tested Online n=79 median (IQR)*	Tested in Face-to-face service n=164 median (IQR)*	Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
Trust in face-to-face services	4,20	18, (16,20)	19 (16,20)	18 (16,20) †	**1.24 (1.07, 1.44)**	**0.004**	**1.25 (1.08, 1.45)**	**0.003**
Trust in online services	8,40	33 (30,39)	36 (32, 40)	32 (30, 38) †	**1.10 (1.02, 1.19)**	**0.012**	1.06 (0.99, 1.15) ‡®	0.114
Subjective norms	3,15	12 (12,15)	14 (12,15)	12 (11,15) †	**1.27 (1.03, 1.57)**	**0.025**	1.22 (0.99, 1.50) ‡	0.060
Self-efficacy to self-test	4,20	17 (15,20)	18 (16,20)	16 (14,19) †	**1.14 (1.01, 1.29)**	**0.028**	1.10 (0.98, 1.24) ‡®	0.112
Health confidence	4,20	17 (16,20)	18 (16, 20)	17 (16,20)	1.00 (0.86, 1.17)	0.980	0.94 (0.79, 1.12) ‡®	0.496
Professional support	5,25	16 (13,19)	14 (12,16)	17 (14,20) †	**0.79 (0.72, 0.87)**	**<0.001**	**0.82 (0.74, 0.90) ‡**	**<0.001**
STI related stigma	6,30	12 (6,14)	12 (6,15)	11 (6,14)	0.99 (0.92, 1.07)	0.811	1.02 (0.93, 1.12) ƒ†	0.679
STI related shame	4,20	9 (7, 12)	9 (7,12)	9 (7, 12)	0.99 (0.90, 1.09)	0.813	1.02 (0.91, 1.15) ƒ†	0.730
Judgement by an HCP	4,20	7 (4,10)	8 (4,10)	7 (4,10)	1.05 (0.95, 1.17)	0.323	1.06 (0.95, 1.19) ƒ	0.299
Convenience (individual items)								
Quick result	1,5	5 (4,5)	5 (4,5)	5 (4,5)	0.84 (0.47, 1.47)	0.536	0.99 (0.54, 1.84) ‡®	0.989
Don't wait too long	1,5	4 (4,5)	4 (4,5)	4 (4,5)	**1.81 (1.20, 2.72)**	**0.004**	**1.91 (1.29, 2.83)**	**0.001**
Take the tests ASAP	1,5	5 (4,5)	4 (4,5)	5 (4,5)	0.73 (0.43, 1.14)	0.245	0.81 (0.48, 1.36) ‡	0.422
Test at a time that suits me	1,5	4 (4,5)	5 (4,5)	4 (4,5)	1.58 (0.93, 2.68)	0.088	1.35 (0.81, 2.25) ®	0.252
Don't have to wait for an appointment	1,5	4 (4,5)	4 (4,5)	4 (4,5)	1.48 (0.92, 2.37)	0.104	1.29 (0.81, 2.07) ƒ	0.284

*lower scores =less likely/important, higher scores= more likely/important. † indicates p=<0.05 (Wilcox rank sum)
Each factor tested in an individual model to avoid multicollinearity between exposure variables. All adjusted analyses adjusted for age, gender, sexual orientation and ethnic group. ‡= adjusted for previous use of online services ®=adjusted for perceived risk of infection. ƒ =adjusted for difficulty in attendance at a face-to-face service † =adjusted for difficulty in receiving a package in the post ‡ adjusted for previous use of online services. OR= Odds Ratio, CI= confidence interval, IQR = interquartile range HCP = Health care provider

Bivariate analysis and crude and adjusted odds of individual factors associated with use of online services compared to use of face-to-face services are presented in Table 9-4. In bivariate and crude analysis, higher levels of trust in face-to-face services (OR=1.24, 95%CI=1.07, 1.44 p=0.004), trust in online services (OR=1.10, 95%CI= 1.02, 1.19, p=0.012), subjective norms (OR=1.27, 95%CI=1.03, 1.57, p=0.025) and self-efficacy to self-test (OR=1.14 95%CI=1.01, 1.29 p=0.028) were significantly associated with use of online services for STI testing. Lower levels of a preference for professional support were significantly associated with use of online services for STI testing (OR=0.79, 95%CI=0.72, 0.87, p=<0.001). Of the single items relating to convenience, higher values for not wanting to wait too long in a waiting room was significantly associated with use of online services for STI testing (OR=1.81, 95%CI=1.20, 2.72, p=0.004). Health confidence, stigma, shame, judgement and four of the five items relating to preferences for convenience were not associated with use of online services for STI testing (Table 9-4).

After adjusting for confounding trust in face-to-face services, less preference for professional support during testing and the convenience item relating to waiting in a waiting room for a test remained significantly associated with use of online services for testing compared with face-to face services. Higher levels of trust in face-to-face services were associated with use of online services compared with face-to-faces services. For each unit increase in the summary score for trust in face-to-face services, participants were 1.25 times as likely to use an online service for testing (adjOR=1.25, 95%CI=1.08, 1.45, p=0.003). Having a lower preference for professional support during testing was significantly associated with use of online services compared with face-to-face services. For each unit increase in the summary score for preference for professional support during testing, participants were 18% less likely to use an online service (adjOR=0.82, 95%CI=0.74, 0.90, p=<0.001). Participants who felt not waiting too long in a waiting room was more important were 1.91 times as likely to use the online service for STI testing than a face-to-face service (adjOR=1.91, 95%CI=1.29, 2.83, p=0.001) (table 4). After adjusting for confounding, trust in online services, subjective norms and self-efficacy to test were no longer significantly associated with using online services for STI testing (Table 9-4). Health confidence, stigma, shame, judgement and four of the five items relating to preferences for convenience remained not associated with use of online services for STI testing after adjusting for confounding (Table 9-4).

9.8 LONGITUDINAL ANALYSIS

Descriptive statistics of the factors influencing use of services at the time of testing are presented in Table 9-5. The median perceived risk of STI infection reported at the time of testing was three out of a maximum of 10 (IQR=1, 6). Difficulty of attending a face-to-face service was higher for online attendances (4/10 for online attendances and 3/10 for clinic attendances p=<0.001), while difficulty of receiving a testing kit in the post was lower for online attendances (4/10 for online attendances and 7/10 for clinic attendances p=<0.001). A higher proportion of testing activity online (85.92%) was done by users with previous experience of using online services, compared with testing in face-to-face services (57.23%) (p=<0.001). There was no difference in the proportion of online testers with a perceived risk of HIV (9.15%) to the proportion of face-to-face testers with a perceived risk of HIV (11.18%) (p=0.513) (Table 9-5).

A total of 467 tests were completed by 243 participants during the study period. Of these, 325 (69.6%) were done using face-to-face services and 142 (30.4%) were carried out using online services. The number of tests carried out by participants ranged between 1 and 13 with median of 1 (IQR=1,2). The time from completion of trial to completion of telesurvey ranged (study period) from 345 days to 707 days. Ninety-eight participants (40.3%) tested online at least once, while 178 (73.3%) tested in face-to-face services at least once. Of the 243 participants that tested, 65 (26.8%) tested using online services only, 145 (59.7%) tested using face-to-face services only. Among the 119 participants that tested more than once, 33 (27.7%) used both online and face-to-face services for testing. Place of test for each testing event are presented in Figure 9.2.

Figure 9.2: Number of participants testing online and in face-to-face services for each test during the study period

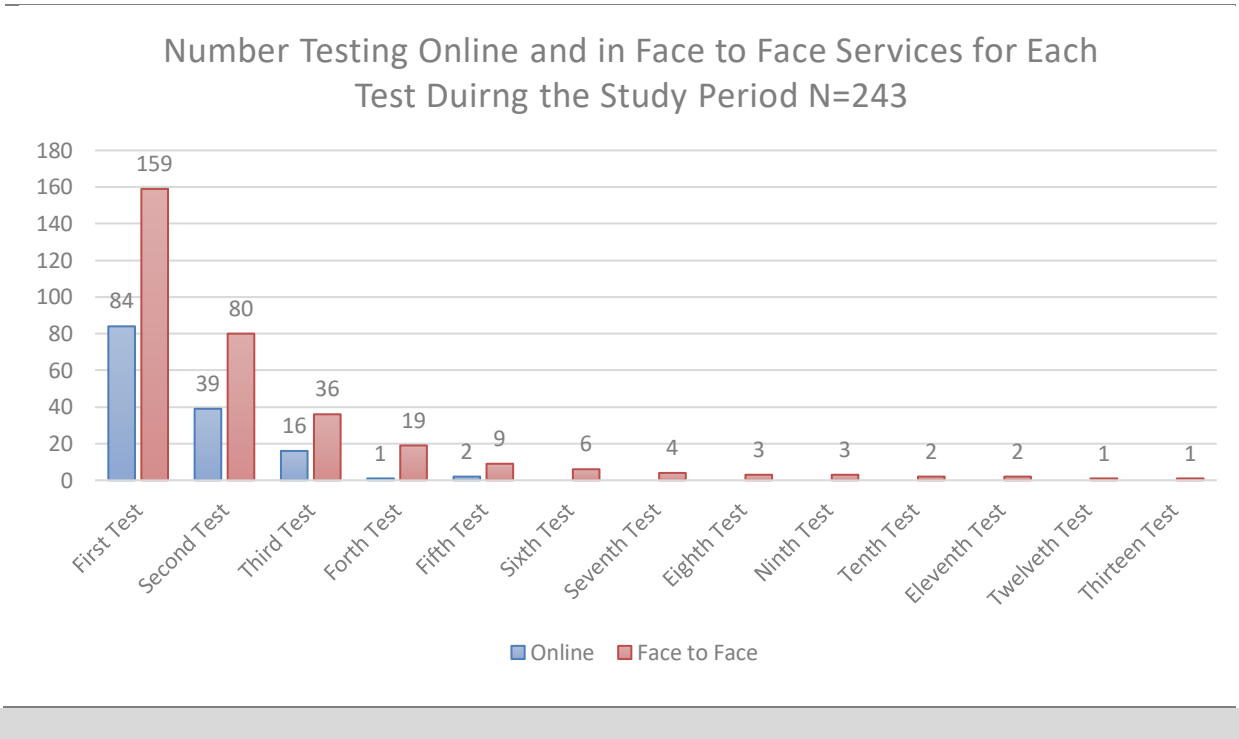


Table 9-5 Descriptive statistics for perceived risk of infection, perceived HIV infection, difficulty attending a face-to-face service, difficulty receiving a package in the post and previous use of online services on place of STI testing activity

Factor		All testing Median (IQR)	Testing in face-to-face services median (IQR)	Testing in online services median (IQR)	P-value
Perceived risk of infection (range=1,10)*		3 (1,6)	4 (1,6)	3 (2,5)	0.160
Difficulty in attending a face-to-face service (range=1,10)*		5 (2,7)	4 (2,7)	7 (5,8)	<0.001
Difficulty in receiving a testing kit in the post (range=1,10)*		1 (1,2)	1 (1,2)	1 (1,1)	<0.001
Previous use of an online service n (%)†	No	159 (34.05)	139 (42.77)	20 (14.08)	<0.001
	Yes	308 (65.95)	186 (57.23)	122 (85.92)	
Perceived HIV infection n (%)†	No	415 (89.44)	286 (88.82)	129 (90.85)	0.513
	Yes	49 (10.56)	36 (11.18)	13 (9.15)	
Total		467	325	142	

IQR= Interquartile Range *1 = extremely easy/ extremely low 10 = extremely difficult/ extremely high. † missing data for 3 observations.

In univariate and multivariate analysis, perceived risk of infection, difficulty in attending a face-to-face service, difficulty in receiving a package in the post and previous use of online services were significantly associated with use of online service for STI self-sampling at home (Table 9-6). After controlling for confounding in multivariate analysis, attendances at online services were less likely if participants had a higher perceived risk of infection. For each unit increase in participants rating for their perceived risk of infection at the time of testing, use of online services for STI self-sampling at home was 29% less likely (OR=0.71 95%CI=0.59, 0.87 p=0.001). Use of online services was more likely when participants found it harder to attend face-to-face services. For each unit increase in participants rating for their difficulty in attending a face-to-face service for testing, participants were 1.64 times as likely to use an online service (OR=1.64 95%CI=1.33, 2.02 p=<0.001). Online service use was more likely when participants that found it easier to receive a package at home. For each unit increase in participants rating for their difficulty in receiving a sampling package at home, participants were 84% less likely to use online services (OR=0.16 95%CI= 0.05, 0.50 p=0.002). Online service use was 6.59 times as likely if a user had tested online previously, compared with those that had not previously used an online service (OR=6.59 95%CI=1.73, 25.00 p=0.006). There was no association between perceived risk of HIV and use of online services for STI testing in crude (p=0.148) or adjusted analysis (p=0.754).

Table 9-6 Longitudinal associations of the perceived risk, difficulty attending face-to-face services, difficulty receiving a package in the post, perceived infection and previous use of online services with use of online service for STI self-sampling at home.

Factor	Crude OR (95%CI) N=243	p-value	Adjusted OR (95%CI) N=243	p- value
Perceived risk of infection	0.71 (0.59, 0.87)	0.001	0.71 (0.59, 0.87) [α]	0.001
Difficulty in attending a face-to-face service	1.77 (1.41, 2.22)	<0.001	1.64 (1.33, 2.02) [†ƒ]	<0.001
Difficulty in receiving a testing kit in the post	0.13 (0.04, 0.39)	<0.001	0.16 (0.05,0.50) [†®]	0.002
Previous use of an online service n (%)	8.59 (2.80, 26.32)	<0.001	6.59 (1.73, 25.00) [ƒ®]	0.006
Perceived HIV infection n (%)	0.35 (0.87, 1.45)	0.148	0.78 (0.16, 3.69) [‡]	0.754

OR= Odds Ratio CI= Confidence Interval. All multivariate analysis controlled for age at test and demographic dummy variables for gender, ethnic group, sexual orientation. ®=adjusted for difficulty in attending a face-to-face service, *ƒ*= adjusted for difficulty in receiving a kit in the post †= adjusted for previous use of online services, ‡= adjusted for perceived risk of infection, α= adjusted for perceived risk of HIV infection.

DISCUSSION

9.9 Summary of findings

This chapter identified the factors associated with use of online services compared to face-to-face services for testing for STIs. Use of an online service for the most recent STI test was associated with higher levels of trust in face-to-face services, less preference for professional support and higher preference for not waiting too long in a waiting room. Among the factors that varied between testing activities, testing in online services was associated with lower perceived risk of infection, finding attending a clinic more difficult, finding receiving an STI testing kit in the post less difficult and previous use of online services for testing. This chapter also presents evidence that some individuals use online and face-to-face services interchangeably. Of those that took more than one test, 27.7% of individuals used both online and clinic services to test for STIs within the study period. This important finding enables professionals planning sexual health service delivery to move away from categorising users as either 'online users' or 'face-to-face users'. They can now consider the role of online services in a population that moves between online and face-to-face services.

9.10 Strengths and weaknesses of the study

This is the first study to measure the influence of the factors that influence use of online services compared to face-to-face services for STI testing among actual service users. Its major strength is that the factors measured are drawn from qualitative interviews with the source population and therefore have inherently high levels of face-validity. It uses scales to measure the latent factors that influence use of online services and controls for demographic characteristics. All scales that were analysed underwent psychometric evaluation and were validated as fit for use in this population. It studies a group of participants who have had equal information about online services, therefore it explores the factors that influence access to online services in the absence of differential information about services. Finally, this is the first study to differentiate factors that vary between testing episodes for the same individual and to measure these quantitatively among actual users of online services.

There are some weaknesses in this study. The study size was limited to trial participants that were willing to take part in future research and responded to invitations to take part in the survey. While the final sample size met the general criteria for minimum sample size when performing multivariable analysis [322], summary scores of themes that had higher levels of variability may have been underpowered in multivariable analysis [323]. The demographic characteristics of this population are relatively homogenous compared to the population of Lambeth and Southwark. As a result, investigations as to whether age or ethnic group modified the effect of the psychological variables were underpowered. All outcome data for service use is self-reported, rather than objective service use data. Participants were asked about their testing activity retrospectively therefore data may be prone to recall bias. However, this is likely to be relatively small in the case of this population because in a previous study of this population 82.11% of all testing activity was verified as correctly reported (Kappa=0.6063) [324]. Because the factors measured in the cross-sectional analysis were reported at the time of the survey and outcome data was reported retrospectively, data may be prone to recall bias, particularly in the case of self-efficacy, where users of

online services may have higher levels of self-efficacy through their realised use of the service [250]. This bias would have resulted in an overestimation of the influence of these factors. Therefore, further causal research including longitudinal studies that follow individuals over time are required to determine if psychological factors precede service use.

9.11 Findings in relation to other studies and implications

Because this study investigated the influence of multiple factors on use of online services for STI testing, each factor investigated is discussed individually in the following section.

9.11.1.1 Trust in online services and Trust in face-to-face services

Higher levels of trust in face-to-face services remained significantly associated with use of online services for testing multivariable analysis after controlling for age, gender, sexual orientation and ethnic group (aOR=1.25, 95%CI=1.08,1.45 p=0.003). This indicates that those with lower levels of trust in face-to-face services are less likely to use a new, novel service for which there is higher levels of uncertainty involved[248]. Similar results were seen in the USA where users level of trust in their doctor was associated with use of preventative services. A population-based telephone survey of older adults in USA saw that respondents with higher levels of trust their personal doctor used preventative services more [252]. The US study, which oversampled participants that racially identified as black also concluded that a low level of trust in personal doctors reported by black respondents was likely to contribute to disparities in access between racial groups [252]. This type of trust might be more important when using online services because of concerns about entering personal information online.

Higher levels of trust in online services were associated with use of online services in crude analysis (OR=1.10, 95%CI=1.02, 1.19 p=0.012), although in multivariable analysis after controlling for demographic factors, previous use of services and perceived risk of infection, this effect was no longer salient (p=0.114). The absence of a significant association between trust in online services and use of online services in multivariable analysis may be a result of a lack of power for this analysis. After adjusting for confounding, the effect of trust in online services on use of online services was reduced from OR=1.10 (95% CI=1.02, 1.19) to adjOR=1.06 (95%CI=0.99, 1.15). Because this variable was measured using a larger scale (eight items, compared to four items for trust in face-to-face services) it was subject to higher levels of variability in summary scores. Higher levels of variability in exposure variables require larger samples to detect significant differences [323].

Other studies have reported on the role of trust in the service in access to online services for STI testing. Young people in London reported that trust is an important aspect of access to e-STI testing in qualitative interviews [92]. In Canada, in a survey of 8388 MSM 11.6% reported low levels trust in online services were a barrier to access [84]. It becomes particularly important when health services are new given the higher levels of uncertainty involved [255]. Trust in online services may be an important factor influencing socio-demographic groups in different ways. Evidence from two American studies describe how trust in services differs between demographic groups. In a study investigating trust and sources of health

information, trust in internet sources of health information varied by age and education level. Younger people (aged between 18-34 years) and those more educated were more likely to trust health information from internet sources [325]. In the USA study mentioned earlier, lower levels of trust in GPs was associated with lower levels of use of preventative services among older black participants in the USA [252]. Within the analysis presented in this study, test accuracy is included as a component of trust. This may be one of the more important aspects of trust in online services. In a recent discrete choice experiment with mixed methods design carried out among young people in England, the strongest attribute influencing preferences for asymptomatic chlamydia testing was test accuracy (OR3.24, 95%CI=3.13, 3.36) [326].

Importantly, adjusting for previous use of online services and perceived risk of infection reduced the effect size of trust in online services. This supports evidence from Chapter 6 suggesting that trust in the service is associated with use of the service. Conceptually, trust in services is forward looking, and reflects a commitment to an ongoing relationship [327]. Trust is conceptually linked to satisfaction however, satisfaction is based on past experience and refers to assessment of service performance [327]. Because of the retrospective design of the study, the measurement of trust in this study may also reflect satisfaction in use of services as trust and satisfaction are highly correlated [328]. Additionally, risk of infection confounded the relationship between trust in online services and use of online services. Trust is a way to manage the uncertainty around the expectation that testing is carried out accurately and confidentially [248]. This finding is supported by evidence in the existing literature that indicates that when perceived risk is higher, the importance of trust increases [248]. Therefore, when users perceive risk to be higher, they are less likely to use a newer service, in which they have not yet established trust with [248]. This may explain lower levels of positivity for infection that were seen in the analysis of routinely collected data in Chapter 5. However, over time, if the online service continues to provide an effective channel for STI testing that generates high levels of patient satisfaction, trust in the online service is likely to improve [155].

Demographic factors (age, gender, sexual orientation and ethnic group) were included as confounders in the analyses in this study a priori, based on the findings of Chapter 5. However, in bivariate analyses, no differences in trust in online or face-to-face services were identified between ethnic group, age or sexual orientation, there were differences in trust in online and face-to-face services between males and females (Appendix BI). The lack of association between trust and other demographic factors in this thesis may reflect general higher levels of trust among the trial population from which the sample was taken [218]. Among the general population, the effect of trust may be more pronounced among certain ethnic groups [252].

Both trust in face-to-face services and trust in online services are likely to be important influences to use of online services for STI self-sampling at home. However, the importance of trust in online services is a factor that is likely to become less important over time as the service becomes more established. The finding that trust in face-to-face services influences use of online services is particularly important. It suggests that online services are not likely to improve access among non-users of face-to-face services who are not using services because of lack of trust in services.

9.11.1.2 Subjective norms

Individuals that had more normative beliefs about online services were more likely to use the online service compared to the face-to-face service for STI testing in crude analysis (OR=1.27 (95%CI=1.03, 1.57 p=0.025), and this was borderline significant in multivariable analysis (aOR=1.22 (95%CI=0.99, 1.50 p=0.060) after adjusting for demographic factors and previous use of online services. While the analysis for subjective norms only shows a borderline significance, the effect size (aOR1.22) is relatively large compared to other psychological influences on access such as trust (aOR1.06) and self-efficacy (aOR1.10). While no formal threshold for clinical significance exists for access to services, the relatively large effect size of subjective norms, coupled with the study being underpowered means that this borderline statistically significant result, remains important [329].

In this study the measure of subjective norms captured an individual's normative beliefs of online testing [143, 330]. One other study reports a relationship between STI self-testing and subjective norms, however it compared self-testers to non-testers. In The Netherlands, individuals were more likely to self-test for HIV if they felt self-testing was more normal (OR=1.8, p=<0.05)[151]. The analysis in this study compares online testers to those testing in face-to-face services. Therefore, the findings from this thesis suggest subjective norms around online testing influence where someone tests, not if they test.

These findings may underestimate the true effect of subjective norms. The association of subjective norms is expected to be stronger for individuals with no prior exposure to a service as they are more likely to rely on the actions and reactions of others to inform their own use [331]. This study investigates the influence of subjective norms among participants from the intervention arm of the trial population who have all had exposure to online services. Therefore, the influence of subjective norms may be stronger among the general population who have had no exposure to the service or who may not have heard of the service before.

Subjective norms are more influential during early stages of innovation implementation when users have limited direct experience from which to develop an attitude [332]. Evidence presented in this thesis indicates that the effect of subjective norms is likely to change over time. In Chapter 6 participants described that online services would be perceived as more normal as they become more established in sexual health service delivery. This was supported in two further analyses in the thesis. The analysis of test-retest reliability in Chapter 8 indicated that the scale for subjective norms was not stable over time. Then in bivariate analysis in this chapter, previous use of services was identified as a confounder of the relationship between subjective norms and use of services. Therefore, while there is evidence that subjective norms influence the use of online services now, the influence of subjective norms is likely to change over time as more individuals gain more experience using the service.

However, subjective norms may remain an important factor influencing use of services among some groups. There is evidence that some people are under more normative control than others [333]. In a within and between person analysis on the influence of attitudes and normative beliefs on behavioural outcomes, normative beliefs were more dominant within certain people, across different behaviours [333]. Therefore,

efforts should be made to identify whether normative beliefs around testing online are lower in certain groups. If so, interventions to improve normative beliefs around testing online should target these groups.

9.11.1.3 Professional support, Self-efficacy and Health confidence

A higher preference for professional support remained associated with use of online services in crude analysis (OR=0.79 95%CI=0.72, 0.87 p=<0.001) and in multivariable analysis (aOR=0.82 95%CI=0.74, 0.90 p=<0.001) after adjusting for demographic factors and previous use of online services. The absence of professional support during the sampling procedure has been reported as both a barrier and a facilitator of access to STI testing in other studies [84, 170]. In a survey of 8388 MSM in Canada investigating internet-based testing for STIs, 17.97% reported at the absence of a doctor or nurse as a perceived drawback of online testing, while 9.81% said the absence of a doctor or nurse was a benefit of using online services for testing. [84] Similarly, in interviews with 25 young people in London, participants described a tension between wanting faceless health care to reduce risk of feeling stigmatized or embarrassed and wanting a health care professional present during testing to deal with the anxieties associated with self-sampling and worry about results [170]. This was also seen in interviews in Chapter 6 where participants reported the positive and negative influence of potential judgement from a health care provider on access to STI testing services. This study included a measure for the positive influence of a health care provider (professional support) and the negative influence of a health care provider (judgement). In the analysis presented in in this study, there was no evidence that participants that used online services differed from users of face-to-face service users in terms of their perceived judgement from a healthcare provider (OR=1.05, 95%CI=0.95, 1.17 p=0.323). However, the study population were relatively homogenous and may not have captured the higher level of perceived judgement from a healthcare provider among groups for whom stigma within the population is higher, such as BME groups, MSM and young people [63]. Future studies should investigate the contrasting influence of the presence of a healthcare provider specifically among BME groups, young people and MSM.

Self-efficacy to use the online service was associated with use of online services in crude analysis (OR=1.14, 95%CI=1.01, 1.29 p=0.028), but not in multivariable analysis (aOR=1.10, 95%CI=0.98, 1.24 p=0.112) after controlling for demographic factors, previous use of online services and perceived risk of infection. Evidence from other studies suggests self-efficacy may be an important influence to use of online services. In a qualitative study of young people in London, participants expressed concerns about self-efficacy to self-sample and achieve an accurate result [170]. Concerns about one's ability to test correctly were also reported in another qualitative study in the West Midlands [149]. The multivariable analysis in this study may have been underpowered to detect any association between self-efficacy and use of online services. However, because of the retrospective design of this study there is likely to be an overestimation of the influence of self-efficacy [248]. Further work is required to establish the influence of self-efficacy in the use of online services for self-testing. The findings of this thesis suggest that, self-efficacy may not be a barrier to accessing online services, although many individuals still prefer to test in the presence of a healthcare provider.

Health confidence was not associated with use of online services in crude or multivariable analysis. General health confidence was measured using the Health Confidence Score (HCS). The HCS measures individuals' confidence in their ability to manage their own health and engage with health and care providers and was designed as a shorter alternative to the patient activation measure (PAM) [284]. This study found no association between health confidence score and use of online services for testing. Because the HCS measures both an individual's ability to manage one's own health as well as their ability to engage with health care providers about their own health, it may lack the sensitivity to differentiate between users of online services (which require management of one's own health) and face-to-face services (which require engagement with a healthcare provider). However, it is encouraging that users of online services do not differ from users of face-to-face services in terms of their health confidence.

Evidence from Chapter 6 indicates that preference for professional support, self-efficacy and health confidence are influenced by perceived risk of infection. Participants described how increased risk of infection increased the preference for seeing a health care provider, reduced self-efficacy and reduced health confidence. In this study, the analysis for self-efficacy and health confidence controlled for perceived risk of infection, however, no relationship between professional support and perceived risk of infection was detected in bivariate analysis. This suggests that perceived risk may influence health confidence and self-efficacy, but a preference for professional support remains important regardless of perceived risk of infection.

Theoretically, an individual's preference for professional support is closely linked to their self-efficacy and health confidence. Self-efficacy captures whether an individual feels they can carry out the process of testing online effectively, health confidence captures an individual's ability to manage their own health while preference for professional support captures whether an individual would prefer to test with support. Contrary to the theoretical links, in this study, only professional support remained significantly associated with use of online services in multivariable analysis. The findings of this study indicate that even among those that feel able to test using an online service and confident to manage their own sexual health, a preference for professional support when testing remains important.

9.11.1.4 Privacy

In this study privacy was measured via three scales for stigma, shame and judgement. In both crude and multivariable analysis there was no association between stigma, shame or judgement with use of online services. The increased level of privacy and therefore reduction in potential stigma or judgement or perceived shame that online services offer users is commonly stated as a facilitator of access to online services in qualitative studies and quantitative studies of potential service users [84, 176]. In a systematic review of 18 studies that assessed the attitudes and acceptability of HIV self-testing among key populations globally, among studies in developing settings, 12 of 18 studies reported privacy as a benefit of HIV self-testing [176]. However, this study found no differences in terms of feelings of shame, perceptions of stigma and judgement between non-users, those that tested online and those that tested in face-to-face services.

The reason these factors were not found to influence use of services may be because testing at home may increase some aspects of privacy by avoiding a clinic, but it may also reduce privacy by other means.

Evidence from qualitative studies suggests that users of online service may be concerned about their domestic and social privacy, for example, concealing any evidence of STI testing or diagnosis from their mobile device or computer from family and friends. [92, 170]. Studies have also highlighted that domestic and social privacy may be more important among younger people who may be less able to conceal evidence of testing on their phone, computer or mobile device than older people, as well as MSM and those living in shared accommodation [170, 181, 185]. The measures used to capture feelings about stigma, shame and judgement in this study do not discriminate between how these perceived feelings may differ about disclosure of testing in public and in the home. However, the single item question about difficulty receiving a package containing a testing kit at home may have captured the variation in testing online caused by the need to conceal testing from members of the household. In Chapter 6, this factor was judged as a convenience related factor, however it may in truth relate to privacy. Those that found it difficult to receive a testing kit in the post were much less likely to use an online service (aOR=0.16, 95%CI=0.05, 0.50 p=<0.001). Therefore, being able to conceal testing is an important influence of access to online services.

9.11.1.5 Convenience

In the cross-sectional analysis presented in this chapter, only one of the five stable convenience items was associated with use of online services. In both crude and multivariable analysis, participants that considered not waiting too long in a waiting room as an important aspect of their choice in where they tested were more likely to use an online service for testing (aOR=1.91, 95%CI= 1.29, 2.83 p=0.001). The adjusted analysis controlled for age, gender, sexual orientation and ethnic group. This item had the largest effect on use of online services among all the factors included within the cross-sectional analyses. All other aspects of convenience were not significantly associated with use of online services for testing in crude, or multivariable analysis. Preferences for a quick result, taking a test as soon as possible, taking a test at a time that suits themselves and not waiting for an appointment were not associated with use of online services compared to face-to-face services.

In Chapter 6, participants described weighing up the accessibility of online or face-to-face services based on the context of where and who they lived with and their work/study hours and location. Because the population within the study were relatively young (aged less than 30 years) participants also described living and working context to be changeable between testing episodes. These aspects of convenience were therefore analysed in the longitudinal analysis. In Chapter 6, participants also described how the accessibility of a service became less important if perceived risk was high. If users perceived themselves to be at higher risk of infection, they were willing to use a less convenient service if they had higher levels of trust in that service. However, in the longitudinal analysis in this study, perceived risk was not identified as a confounder of accessibility of face-to-face or postal receipt of a kit.

Within the longitudinal analysis difficulty attending a face-to-face service (aOR=1.64, 95%CI=1.33, 2.02 p=<0.001) and difficulty receiving a testing kit in the post (aOR=0.16, 95%CI=0.05, 0.50 p=<0.001) were associated with access to online services in multi-variable analysis. These multivariable analyses adjusted for age, gender, sexual orientation and ethnic group, previous use of services and either difficulty attending

face-to-face services or difficulty receiving a package in the post. For each unit increase in difficulty attending a clinic (measured between 1 and 10), individuals were 1.64 times more likely to access online services. Face-to-face services can be more difficult for individuals to access if they are concerned about long wait times, inconvenient opening hours and stigma associated with attending a clinic for STI testing [50, 63-65]. The results from this analysis suggest online services could improve access to testing amongst groups for which clinic attendance is difficult, particularly during times when users perceive their risk to be low or require routine testing.

Finding it difficult to receive a package in the post made people less likely to use online services. For each unit increase in difficult receiving a package in the post, individuals were more than six times less likely to use an online service for testing. This had the largest negative influence on use of online services of the factors analysed in this thesis. When considering receiving a postal kit at home, users may have considered the difficulty of concealing STI testing from family or friends [170] (Chapter 6). This factor therefore relates to privacy and may be more problematic for younger people, for whom living with parents is more common. Similar services have provided alternative methods of kit delivery to postal delivery, such as pick up points, although kit return rates have been low using these strategies [75]. If online service providers are going to address the barrier to access that receiving the testing kit in the post provides, further work with users for whom this is priority is needed to design an alternative option for kit delivery.

Convenience has been cited as a key facilitator to access of online services among key target populations in acceptability studies [170, 176]. In contrast, in a qualitative study in Scotland investigating views of an online chlamydia screening website, young deprived men from semi-rural locations didn't find the online service more convenient than a clinic service [334]. One of the reasons for these conflicted findings may be because convenience needs to be unpicked to understand more about the different aspects of a service and how they provide convenience. Although it was not the original objective, by looking at each aspect of convenience individually, and controlling for perceived risk of infection where appropriate, this study goes some of the way to unpicking how online services offer, and don't offer convenience.

9.11.1.6 Perceived risk of infection

In the longitudinal analysis, higher levels of perceived risk of infection was associated with lower odds of accessing online services after adjusting for demographic factors and perceived risk of HIV (aOR=0.71, 95%CI=0.59, 0.87 p=0.001). One other study in the UK has shown a similar association between perceived risk of infection and use of online services for STI self-sampling [150]. Powell et al. identified that intention to be tested by a health care provider was predicted by higher levels of vulnerability to infection among potential service users [150]. This analysis describes the influence of perceived risk on testing in online services or face-to-face services. Findings from Chapter 6 offer some insight into the possible mechanism for this as participants reported that higher levels of perceived risk of infection lead to higher levels of anxiety which a consultation with a health care provider may be able to ease. In addition, people may prefer face-to-face services for testing when they perceive their risk to be higher because of doubts about test accuracy using the online kit, which could become more pertinent when perceived risk is higher risk.

The findings presented in this chapter explain the lower infection positivity rates seen in routinely collected online service data presented in Chapter 5 [238]. In this case, it is possible that online services play a role in serving individuals for routine testing and for testing activity when individuals perceive their risk to be low, while face-to-face services serve individuals when they perceive their risk of infection to be higher [191]. This finding is supported by recent evidence from a service CT and GC home testing service in Birmingham and Solihull that found lower diagnosis rates in the home testing service (8%) than the clinic service (10%) p=<0.001, however the difference seen in the Birmingham and Solihull study is much smaller than what is seen Chapter 5 [231].

Online services may also increase testing among users who have not used clinic services because they don't feel they are at high risk of infection. Evidence from analysis of Natsal-3 data indicates that many men and women underestimate their risk of infection, and many of these individuals are not accessing STI testing services [335]. Early data shows that since the provision of online services has been made available to residents of Lambeth and Southwark, the number of STI tests carried out by residents has increased [336]. Coupled with this, the findings from the Gettested Trial (Appendix C) indicate that the online service increased testing among those who had never tested before[218]. Therefore the online service may be addressing unmet need for testing but may also enable people to test more often [218, 336].

Although this study found no association between perceived risk of HIV and use of online services, this is likely to be a result of the small numbers of those perceiving themselves to be at risk of HIV at the time of testing. In only 49 of the 467 tests did the participant perceive themselves to be at risk of HIV. Further longitudinal studies involving populations at higher risk of HIV may be able to establish whether perceived risk of HIV influences use of online services for testing.

9.11.1.7 Previous use of online services

The longitudinal analysis investigated the influence of previous use of online services on future use of online services. Consistent with qualitative findings, users that had tested for STIs using online services in the past were more likely to use online services to test than those that had not. These findings are supported by theories of access to health care which describe how a positive experience of using a service can have a positive influence on subsequent use of the service [101, 155]. One possible mechanism of action for this is; a positive experience using the online service could result in increased satisfaction, therefore increased levels of trust [151, 158, 327]. This could also relate to increases in self-efficacy to self-sample and changes to subjective norms that may result from previous use of online services. If this is the case, as online services become more established and service use progresses from use by early adopters to generalized use, gaps in access between groups could narrow making access to online services more equitable between demographic groups. However, the characteristics of users should be monitored continually to determine whether there are demographic groups who are not accessing online services. If these gaps remain for certain groups, service providers should invest in strategies that increase use among these groups.

9.11.1.8 Interchangeable service use

This study highlights the importance of considering that the same person may access online and face-to-face services interchangeably. Among the 119 participants that tested more than once during the study period, a small proportion (27.7%) tested in both online and face-to-face services. This finding is important because this is the first study to report interchangeable use between online and face-to-face services. The proportion of those that do use both online and face to face services is small. However, this proportion reflects the length of time the study collected data for. What can be taken from this is that at least for some people, online and face-to-face services are both accessible. Among these individuals, the place that they test is influenced by factors that vary between testing episodes, including, perceived risk of infection, difficulty attending a clinic at the time of testing and difficulty receiving a package in the post.

9.12 Viewing the findings in relation to Andersen's Model for Access to Medical Care

Chapter 9 measures the influence of the factors identified in Chapter 6 on use of online services. Because this chapter does not identify any new factors associated with use of online services, the findings of Chapter 9 are placed within an adapted version of the model presented in Chapter 6 (Figure 6.1) which described the relationships between factors. Figure 9.3 presents this adapted version of the model. It illustrates the findings of Chapter 9 by describing the relative importance of the factors associated with use of online services and the confirmed relationships between these factors.

In Figure 9, factors in dark blue text reflect factors identified in Chapter 9 as important influences to use of online services for self-sampling at home in multivariable analysis. Trust in face-to-face services, less preference for professional support, a preference for not waiting in a waiting room, perceived risk of infection, ease of receiving a package at home and ease of attending a clinic represent important individual factors associated with use of online services compared to face-to-face services. The components of the individual factors within the model have been adapted to reflect the proximity of ease of attending a clinic and ease of receiving a package in the post were to use of online services. Rather than only need characteristics being most proximal to use, ease of receiving a package at home and ease of attending a clinic are also within this category. Among the contextual characteristics, method of communication or package delivery used by the service is highlighted as an important influence to use of online services. This is because of the interaction between this aspect of the service and how easy or difficult an individual may find it to receive a package at home. The importance of previous use of online services on future use of services is highlighted within the outcomes of service use, along with the hypothesised mechanisms of this influence.

Factors in blue grey text in Figure 9.3 reflect factors that may be an important barrier to use of services when online services are new, however these barriers may facilitate access in the future. The individual factors include trust in online services, subjective norms and self-efficacy to self-sample using the online service. Evidence for how these factors change over time is presented in Chapter 6 which suggests, that as services become more established over time, the influence of these factors as a barrier to access will be reduced. Among the contextual characteristics, societal norms around STI testing is also identified as a

factor that may act as a barrier to access in early service use but become a facilitator to service use as the service becomes more established.

Health confidence, privacy (stigma, judgement and shame), other convenience factors and demographics were not associated with use of online services in Chapter 9. In Figure 9.3, these factors are represented in orange text as factors not directly influencing use of online services. They remain in the model because they represent factors that may influence access to online services via other factors or may be direct influences of access of online services in another service context or among a different population. Among the contextual characteristics, service reliability, health information, the online interface and the sampling procedure represent service-related factors that were not directly measured in this study. These are represented in green text to highlight that, although they were not measured in this study, they remain important service characteristics because of their interaction with trust in the online service and self-efficacy.

Arrows in Figure 9.3 represent the direction of influence of the factors. Blue arrows reflect those from the original Andersen model that have been confirmed by the studies in Chapters 6 and 9. The exception to this is the two sided arrow between contextual and individual characteristics that, as previously stated in Chapter 6 was adapted to reflect the interrelationship between the service characteristics and the characteristics of the individual. Grey arrows reflect relationships between individual factors that were identified in qualitative interviews in Chapter 6. The grey dotted line between privacy and ease of receiving a package at home reflects the link between these two factors as both reflecting an individuals' preference for conceal testing.

In this section, the model from Chapter 6, which was adapted from the Andersen model for Access to Medical Care has been further adapted to reflect the findings of Chapter 9. This model has been used as an organising framework through which to view the findings of these studies. In Chapter 10, the discussion chapter of the thesis, this adapted model will be used to help make judgement of equity of access to online services for STI self-sampling at home.

Figure 9.3: Viewing the findings of Chapter 9 within Andersen's Model for Access to Medical Care

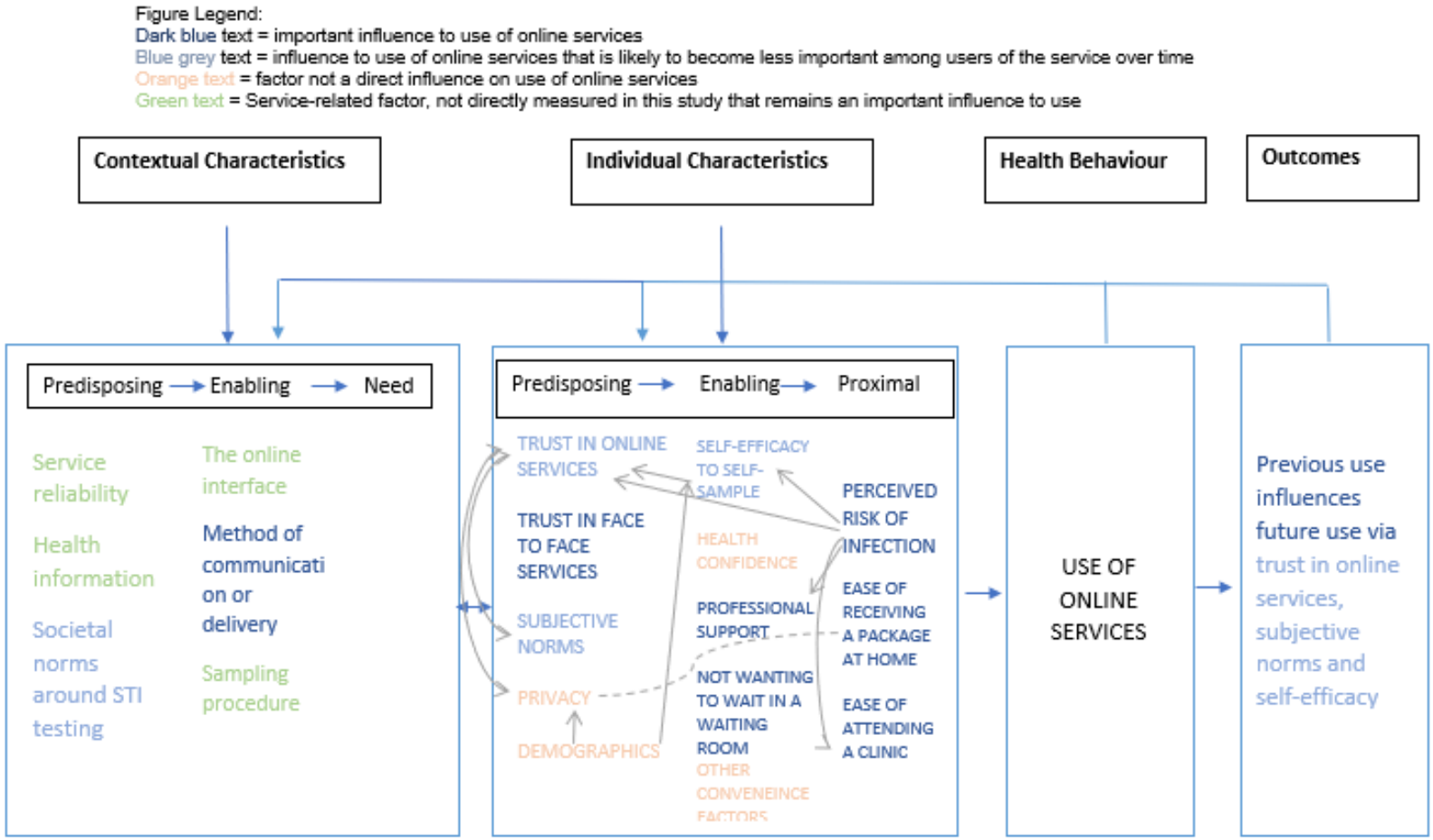


Figure Legend:
Dark blue text = important influence to use of online services
Blue grey text = influence to use of online services that is likely to become less important among users of the service over time
Orange text = factor not a direct influence on use of online services
Green text = Service-related factor, not directly measured in this study that remains an important influence to use
Blue arrow = relationship depicted by Andersen's model and confirmed in Chapters 6 and 9
Grey arrow = relationship identified in qualitative interviews (dotted line = factors related but exist in different components of the model)

CONCLUSION

This chapter investigated how the barriers and facilitators to use of online services for STI self-sampling at home that were identified in Chapter 6 influence use of online services for STI testing compared to face-to-face testing. It measured the effect of important factors associated with the individual and the individual's circumstances around the testing episode. Importantly, this study also provided evidence that people do use online and face-to-face services interchangeably. These findings were then placed within the Andersen model for Access to Medical Care. The wider implications of these findings in relation to equity of access to services will be discussed in Chapter 10.

Chapter 10 DISCUSSION

Introduction

This final chapter begins by summarising the findings from the results chapters presented in the thesis. The findings are then interpreted in relation to equity of access to online services, drawing on concepts of access and equity defined in Chapter 2. Judgements of equity are made by understanding the factors influencing access to online services within the wider context of sexual health service delivery in Lambeth and Southwark. The process of judging equity begins by organising factors identified within the framework of the Andersen model for Access to Medical Care. The criteria for judging equity outlined by the WHO are then applied to the factors within the model. The implications of the findings to online service developers, commissioners and for future research are then described. Finally, the strengths and limitations of the wider thesis and the model applied within the thesis are discussed before the thesis is concluded.

Summary of findings

This thesis employed a mixed-methods approach to investigate access to online services. Six results chapters were presented. These include a scoping review (Chapter 3), a cross-sectional analysis of routinely collected data (Chapter 5), qualitative interviews (Chapter 6), two survey development chapters (Chapters 7 and 8) and an analysis of survey data (Chapter 9). The following section summarises and discusses the results of each of these chapters in the context of the entire thesis.

In Chapter 3 a scoping review of literature relating to access to online services for STI self-sampling was presented. The results of the review returned 37 studies reporting a range of individual and service-related factors that influence access to online services. The studies included in the review investigated a range of service types, including home-based testing, clinic based self-sampling and self-testing services, with and without an online interface. They also included services that offer testing for chlamydia only, chlamydia and gonorrhoea, HIV only and HIV and syphilis. Some studies investigated willingness to use a potential service, while others investigated actual use of existing services among populations in the UK, USA and Australia.

The review was able to identify factors that may influence access to online services for STI self-sampling at home. However, evidence for how these factors influence service use was conflicting. Specifically, evidence relating to factors associated with the individual, such demographic or social factors was inconsistent between studies. For example, how age, gender or education level influenced access differed between studies. Conversely, there was relative consistency on how the specific aspects of the design of an online service would influence who accesses the service. For example, there was consistent evidence that a service that communicates with users in a way that the user can maintain privacy can improve access.

The lack of consistency of the influence of individual and social factors on access to online services is likely to be because the studies included in the review differed in terms of the service characteristics and the context within which the service was delivered. Access to services involves an interaction between the characteristics of the service and the characteristics of the individual accessing the service [97, 106, 108]. Access is also influenced by the wider environment of health care, such as the availability or, cost of services and the quality of alternative services [97]. Therefore, to understand the individual factors that influence access to SH:24, an investigation of access to the specific characteristics of the service design of SH:24 needed to take place within the context of sexual health service delivery in Lambeth and Southwark.

The first stage of this investigation was to determine whether the characteristics of online service users differed from clinic service users. Chapter 5 presented this investigation. It found differential use of online services for STI self-sampling at home between socio-demographic groups. There were lower odds of use of online services among BME groups and young people aged less than 20 years. It also found that there are lower levels of positive diagnoses of chlamydia and gonorrhoea seen in users of the online service. Chapter 5 also demonstrated that among those that ordered a kit, there were differential characteristics of those that returned a self-sampling kit, from those that did not return a kit. Among individuals that ordered a self-sampling kit from the online service, those most likely to return kits for testing were aged over 20 years and white British.

The study in Chapter 5 was the first study to investigate actual use of online services for STI self-sampling at home in the UK in a real-life setting. The differential use of online services by demographic groups seen highlighted potential inequity in access to online services. Although the analysis was carried out at an early stage of service delivery, even at this early stage, a substantial proportion of all basic STI testing (44.5%) was being carried out online. Lower levels of positivity for infection seen in online users may be a result of lower access among higher-risk groups, including young people aged between 16 and 20 years and BME groups. Prior to this study, access to the online service had been investigated in a trial setting. The Gettested Trial investigated uptake to SH:24 under trial conditions and found no evidence of differential uptake between demographic groups [218]. During the trial, all participants received equitable information about the online service. This may not be the case in real-life settings. Therefore, one potential reason for the difference between findings from the observational study in Chapter 5 and the findings of the trial could be because trial participants received equitable information and as a result were equally aware of online services.

The role that information plays in the differences seen between the trial and the real-world findings may be more complex. Existing evidence suggests the type of health service information given to users and the source of the information can influence use of services differently between ethnic groups [63, 252]. Findings from a qualitative study in the UK indicated that black African migrant communities rely on information from informal networks and word of mouth to inform HIV testing options [63]. In a cross-sectional study carried out in the USA, which investigated differences in the effect of trust in services on preventative health service

use between racial groups, black women were more likely to trust informal sources of health service information [252]. In the trial, information about the online service was delivered by text message. It is possible that participants considered this a relatively informal method of sharing information, therefore differences in access between groups would have been smaller. In addition, in the trial, only 25% of participants in the intervention group were from BME groups, whereas the general population of Lambeth and Southwark is composed of around 48% BME groups [209, 210]. Not only did the trial have a smaller proportion of BME groups than the general population, just through the process of selecting participants willing to take part in a trial, individuals that took part in the trial were more likely to have a greater interest in STI testing and would therefore interact with information about services and services differently from the general population [218]. BME trial participants may not represent the general population of BME groups therefore differences in the interpretation of information between ethnic groups would result in larger differences in a real-life setting [209, 210, 218]. While inequitable information may play a role in differences in access seen between groups, there may be other factors influencing differential access between groups.

Chapter 5 was able to demonstrate that in a real-life setting, access to online services was differential between socio-demographic groups. Because it analysed routinely collected data it was therefore limited to describing only the socio-demographic differences between users of online and users of clinic services. Evidence from the review in Chapter 3 suggests that other factors may play a role in access to STI self-sampling at home. The reasons for the differences in access seen between groups remained unclear. To interpret whether differences reflect equitable or inequitable differences in access to online services, further investigation was required to understand what the underlying reasons for differences in access may be. Equity of access to services was defined in Chapter 2 as "*The absence of avoidable or remediable differences in access to services among groups of people, whether those groups are defined socially, economically, demographically, or geographically"* [110]. The overall aim of achieving equity is equal access for equal need for services [110].

The aim of Chapter 6 was to explore what the underlying reasons for differences in access between demographic groups may be. To do this, Chapter 6 explored the barriers and facilitators to use of online services for STI self-sampling at home. Qualitative interviews were carried out with participants of the Gettested Trial who were randomised to the intervention arm. This group were particularly interesting because they included those that used the service during the trial and those that did not. They also included participants from different genders, age groups, ethnic group, sexual orientation and risk category. By exploring the reasons underlying use and non-use of online services this study explored both potential and realised access to online services.

Chapter 6 identified barriers and facilitators to use of online services and identified six key themes. These themes included trust, subjective norms, privacy, self-efficacy, convenience and perceived risk of infection. Within each of these themes, participants described how the characteristics of the individual accessing the services interacted with the characteristics of the service and the context. For example, participants described how privacy, and therefore concealing testing was more important among young people who

lived at home, therefore a postal delivery of a test kit was inconvenient. The way participants described the interaction between the context and the individual accessing the services is in line with theories of access to health services that describe access as the 'fit' between the service and the population [106, 108, 109, 167]. Participants also described how the themes interacted with other themes to influence access, illustrating many of the feedback mechanisms depicted in Andersen's Model for Access to Medical Care [97]. Importantly, findings from interviews also described how some of these influences may change over time, as online services become more established.

Chapter 6 identified the key themes influencing access to online services for STI self-sampling at home then, in the discussion, placed them in the Andersen model for Access to Medical Care [167]. By placing the findings within the model, it was used as a lens through which to view access by organising the factors, which act and interact to influence access to online services for STI self-sampling at home. The model helped to differentiate the service-related factors (contextual) and the individual factors. Among the individual factors, trust, subjective norms and privacy were identified as predisposing factors. Self-efficacy, and convenience were identified as enabling factors. Finally, perceived risk was identified as a need factor. However, the model did not fit the data perfectly. Findings from interviews indicated a two-way relationship between the characteristics of the service and the characteristics of the individual. The findings from interviews also indicated important interactions between individual characteristics, such as perceived risk of infection influencing the level of trust one has in a service to deliver an accurate result. Participants trusted face to face services more than online services, this became more important when they felt at greater risk. Finally, in Andersen's model, need is described as most proximal to service use, however, within interviews participants described aspects of convenience (ease of concealing testing kit if delivered to home and ease of attending a clinic) as proximal to service use, in addition to need.

The key themes identified in Chapter 6 may be the underlying reasons behind differential access between groups that is evident in the findings of Chapter 5. Placing the findings of Chapter 6 within the Andersen model helped to organise these factors to identify which factors represent equitable reasons for differential access and which factors represent inequitable reasons for differences in access. However, using Andersen and colleague's guidance on judgements of equity, access to services is deemed fair or equitable if need-based criteria are the main determinants of access [113]. Therefore, to investigate equity of access to online services, further investigation was needed to explore which of these factors explain most of the variance in access. In addition, by understanding which of these factors influence access the most, service designers can focus their efforts on those factors with the largest effect to adapt services to improve access.

Chapters 7 and 8 developed a measurement tool (CMS) to quantify the influence of the key themes identified in Chapter 6, on access to online services for STI self-sampling at home. Chapter 7 developed items and scales, and Chapter 8 presented a comprehensive psychometric evaluation and refinement of these scales. In Chapter 7, fifty-four survey items were developed to measure 14 theoretical domains of the six themes identified as barriers and facilitators to access to online services for STI testing at home in phase one. Of the 54 items, 50 contributed to 10 multi-item scales and four contributed to single items. Of the 10 multi-item scales that were developed, four multi-item scales were adapted from scales in existing

literature, while the remaining six multi-item scales were developed within the chapter. Telephone and e-survey implementation methods were selected for appropriate administration of scales and single items.

Chapter 8 evaluated the psychometric properties the 10 scales that reflect the factors that influence use of online services for self-sampling for STIs at home. The evaluation of the scales was done among residents of the London boroughs of Lambeth and Southwark. Six of the 10 scales (trust in sexual health clinics, feelings about shame, stigma and judgement, ability to self-test and health confidence scale) were established as psychometrically robust, fully meeting reliability, validity and feasibility criteria. These were included in the final survey and analysed as scales in Chapter 9.

The scale for trust in online STI testing services was psychometrically robust, meeting criteria for reliability, validity and feasibility, however model fit could be improved. The scale contained eight items relating to trust in information, trust in the accuracy of the results, trust in the test kit, trust in the discretion of the packaging and trust in the postal system to deliver the sample separately. Factor loadings were moderate to high among all items therefore, all items were retained. In addition, all items were supported by qualitative data. There was a large amount of error correlation between variables suggesting items may be overlapping. Therefore, further refinements to the scale in view of these error terms could improve model fit.

The scale for professional support was psychometrically robust, meeting criteria for validity and feasibility. It contained items relating to the general importance of a health care provider (HCP), the importance of the advice they give about risk and safe sex, the importance of the help they give during testing and a final item about general feelings about testing in the absence of a HCP. The item relating to advice on safe sex fell below (0.38) the threshold for the validity of factor loadings (≥0.40). However, this threshold is relatively conservative, and the items inclusion is supported by qualitative data. Like the scale for trust in online services, further work on this scale could improve the model fit. This work should consider the error correlations between the items.

The scale for subjective norms was psychometrically robust in terms of validity, reliability and feasibility. However, test-retest reliability suggests that this scale may not be stable over time. Subjective norms are perceived social pressures to engage or not engage in a behaviour [143]. Subjective norms around using online services for STI testing online are determined by beliefs about the opinions of specific important others. The test-retest reliability analysis showed that, even within a two-week time-period, subjective norms around STI testing online was subject to variation. Qualitative interviews presented in Chapter 6 identified that subjective norms were likely to change over time, although change was anticipated to be slow. This variability in a short space of time may be a result of participation in the survey which may have stimulated conversations about STI testing online with important others, and therefore influenced subjective norms.

The scale for convenience did not meet the threshold for internal reliability or validity. This scale was not considered as fit for use and was therefore analysed as single items in Chapter 9. Convenience of access

to services involves users' perceived time and effort expenditures [337]. It involves users being enabled to access services and being able to receive them [337]. The five items that contributed to the convenience scale related to getting a quick result, testing as soon as possible, testing at a time that suits, time in a waiting room and waiting for an appointment. Some of these items related to urgency to test, while others related to preferred timing. This may have been the reason the scale did not perform well in the evaluation. Further work is required to establish a scale or scales that adequately measures convenience of access to services. The final CMS established in Chapter 8 included 50 items that contribute to nine scales and five single items that measure the six key themes.

Chapter 9 used the CMS developed in Chapters 7 and 8 to investigate the barriers and facilitators to use of online and face-to-face services. Chapter 9 used the CMS to quantify the variation in access attributable to each of the factors identified in Chapter 6. It measured the outcome of realised access by measuring use of services. Rather than solely focusing on the outcome of access, it investigated the process of access by measuring the factors that influence access that were identified in chapter 6 [118, 121]. Chapter 9 presented two analyses, a cross-sectional analysis of the factors that are less subject for variation between testing episodes and a longitudinal analysis of the factors that were variable between testing episodes.

In the cross-sectional analyses, after adjusting for confounding the factors that were associated with use of online services included higher levels of trust in face-to-face services (aOR=1.25, 95%CI=1.08,1.45, p=0.003), normative beliefs about testing online (aOR=1.22, 95%CI=0.99, 1.50, p=0.06) and less preference for professional support (aOR=0.82, 95%CI=0.74,0.90, p=<0.001). Individuals for whom not waiting in a waiting room was more important were also more likely to use online services (aOR=1.91, 95%CI=1.29, 2.83, p=0.001). Factors relating to trust in online services (OR=1.10, 95%CI= 1.02, 1.19, p=0.012) and self-efficacy to self-test (OR=1.14, 95%CI=1.01, 1.29, p=0.028) were associated with use of online services in the crude analysis, but not in the adjusted analysis. Although these factors were not associated with use of online services in the adjusted analysis, they may still represent important factors influencing access to online services. The findings of Chapter 6 indicate that self-efficacy, trust in online services and subjective norms may improve with use of online services. The retrospective design of the study is therefore likely to underestimate the effect of these factors. Coupled with this, due to the relatively small sample within this study, it may not have had the power to detect the significance of factors with smaller effects. Therefore, the effect of and importance of subjective norms, trust in online services and self-efficacy may be underestimated in this study. These factors may reflect important influences of use of online services, particularly among those who have never used the online service.

In cross-sectional analyses, the factors associated with privacy (stigma (aOR=1.02, 95%CI= 0.93, 1.12, p=0.989), shame (aOR-1.02, 95%CI=0.91, 1.15 p=0.730) and judgement from a health care provider (aOR=1.06, 95%CI= 0.95, 1.19, p=0.299)) were not associated with use of online services in both crude and adjusted analyses. These findings are in-line with findings from qualitative interviews that although online services enable users to conceal testing by avoiding clinic attendance, sending a package to users' homes gives rise to concerns about concealing testing from family members or housemates. Therefore,

the study in Chapter 9 indicated that online services may not be a suitable alternative point of access among users for whom privacy is important.

Among the other factors investigated in cross-sectional analyses in Chapter 9, health confidence was not associated with use of online services compared to face-to-face services for testing. This may be because the scale used to measure health confidence was not sensitive enough to differentiate between health confidence to self-manage and health confidence to engage with a health care provider. Future studies should include a measure sensitive enough to detect this difference. Nevertheless, the finding that health confidence was not associated with use of online services compared to face-to-face services is encouraging. Only one of the individual items relating to convenience (not wanting to wait in a waiting room) was associated with use of online services compared to face-to-face services in both crude and multi-variable analysis. A preference for a quick result, taking a test as soon as possible, taking a test at a time that suits the user and not having to wait for an appointment were not associated with use of online services compared to face-to-face services. This finding may be relevant to the context of the study, where walk-in face-to-face services are available, and clinics are open during some evenings. These factors may be important in other contexts where clinic service hours are shorter or require appointments.

In the longitudinal analysis, the factors that influenced use of online services included low perceived risk of infection, ease of receiving a package in the post, difficulty attending a clinic and previous use of online services. The finding that lower perceived risk of infection is associated with higher odds of using the online service (aOR=0.71, 95%CI=0.59, 0.87, p=0.001) explains the lower infection positivity rates seen in routinely collected online service data presented in Chapter 5 [238]. The mechanism behind this is evident within Chapter 6, where participants reported that higher levels of perceived risk of infection lead to higher levels of anxiety which a consultation with a health care provider may be able to ease and doubts about test accuracy. Therefore, it is possible that online services play a role in serving individuals for routine testing and for testing activity when individuals perceive their risk to be low, while face-to-face services serve individuals when they perceive their risk of infection to be higher [191]. This finding is consistent with the original aims of the online service[93].

When individuals found it less difficult to receive a package in the post (aOR=0.16, 95%CI=0.05, 0.50, p=0.002) they were more likely to use an online service. This may be more problematic for younger people, for whom living with parents is more common. If online service providers are going to address the barrier to access that receiving the testing kit in the post provides, further work with users for whom this is priority is needed to design an alternative option for kit delivery. The findings from the longitudinal analysis also suggest online services could improve access to testing amongst groups for which clinic attendance is difficult (aOR=1.64, 95%CI=1.33, 2.02, p=<0.001), particularly during times when users perceive their risk to be low or require routine testing.

Importantly, previous use of online services influenced future use of online services. Those who had previously used online services were more likely to use online services (aOR=6.59, 95%CI=1.73, 25.00, p=0.006) for testing. This is encouraging, suggesting a positive experience using the online service could result in increased familiarity and satisfaction, therefore increased levels of trust in online services, self-

efficacy and subjective norms [151, 158, 327]. As online services become more established and service use progresses from use by early adopters to generalized use, gaps in access between groups could narrow, making access to online services more equitable between demographic groups. However, the characteristics of users should be monitored continually to determine whether there are demographic groups who are not accessing online services. If these gaps remain for certain groups, service providers should invest in strategies that increase use among these groups.

Finally, and importantly, Chapter 9 presents evidence that some people use online services and face-to-face services interchangeably. This important finding confirms that, among some people, both online and face-to-face services are accessible. Based on the evidence presented in this thesis, among these people, where they test is dependent on factors relating to risk, convenience, and ability to conceal testing at home, that may vary between testing activities.

In the discussion of Chapter 9, the model developed in Chapter 6 (Figure 6.1) was adapted to reflect the findings of Chapter 9 (Figure 9.3). The adapted model retained the factors and relationships that were identified in Chapter 6 but used colours to reflect the relative importance of the factors within the model.

Interpreting the findings in terms of equity of access to online services

Evaluating equity of access requires the coupling of observation of the distribution of access with value judgements about users (and non-users) needs for service access [120]. This thesis first observed access in Chapter 5, then investigated the underlying reasons behind differences in access in Chapters 6 to 9. It will now make judgements about equity of access based on the findings from these chapters. Equity of access to online services is investigated within the context of wider sexual health service delivery in Lambeth and Southwark where both online and face-to-face services are available for testing. Therefore, judgements of equity of access to online services are made by understanding the factors that influence access to online services, compared to face-to-face services. Value judgements on equity of access to online services are made by considering who this new, novel intervention provides access to when face-to-face services are also available and how the addition of online services to the service mix influences access to STI testing.

Understanding equity of access in this context requires a thoughtful approach to applying the criteria for equity laid out in Chapter 2. Equity is defined in this thesis as equal potential access for equal need. Equal access for equal need refers to equal access to STI testing within the wider sexual health service delivery mix, including face-to-face services. Therefore, the role of *need* in access to online services must be considered in relation accessing online or face-to-face services. One aim of the developers of the online service was to move asymptomatic testers out of clinic services to free up space in clinics for symptomatic or higher risk cases [93]. Therefore, in this context, variations in access between online and face-to-face services that are a result of need would be not just acceptable, but appropriate.

The WHO recommends that access to online services is judged as equitable if differences in access between groups are a result of user choice or early or late adoption patterns, and inequitable if differences

are a result of a lack of resource, social exclusion or health damaging behaviours where choice is restricted [110]. These criteria allow for potential access by acknowledging that differences in access caused by user choice are acceptable and fair. The findings presented in Chapter 5 illustrate differential access to online services between socio-demographic groups. Chapters 6 through 9 investigate the underlying reasons behind these differences in access so that value judgements can be made regarding equity of access to online services. Value judgements on equity involve deciding whether the factors influencing access are unfair or unjust or acceptable or fair [110].

To help make judgements about which factors explain equitable access and which factors contribute to inequitable access, the adaptation of the Andersen Model for Access to Medical Care developed in Chapters 6 and 9 is used. [167]. The model is used as an organising framework for the factors influencing access. Conditions of equity set out by Andersen and colleagues are then considered in combination with the WHO criteria for equity [110, 167]. These conditions are then applied to factors within the framework. Andersen and colleagues define equity of access as occurring when the main variation in access is a result of need, i.e. those with higher need access services more. Within this context, equity of access to online services compared to face-to-face services exists if the main variation in access between the services is a result of need. However, as previously stated, in this context it is acceptable and fair that those with less need access online services more than face-to-face services. Variation in access caused by predisposing and enabling factors may be considered as inequitable. By applying the WHO criteria within Andersen's framework, predisposing and enabling factors that influence access can be judged as equitable or inequitable [110, 167].

Viewing these through the lens of Andersen's framework for access to medical care (Figure 9.3), the factors identified in this thesis represent individual and contextual factors that influence use of services. The model categorises individual factors as predisposing, enabling and proximal factors (including need) and identifies predisposing and enabling contextual factors that influence access. Because the subject of investigation in this thesis was the individual, the focus of the findings is on the individual factors, and how they interact with the service and the context. Equity will be judged based on the individual factors influencing service use, with reference to the corresponding contextual factors.

As described in detail in Chapter 2, predisposing conditions are not directly responsible for use. They are related to a person's ability to cope with the presenting problem and command resources to deal with the problem or their attitudes, values and knowledge of health services [97, 167]. Enabling conditions are those that facilitate or impede use of services [167]. These reflect one's ability to use the service and what the personal costs of using the service are including travel time, time off work or waiting time [104, 167]. The third individual component of Andersen's model relates to need or conditions that laypeople or health care providers recognise as requiring medical treatment [167]. In the adapted model (Figure 9.3), the components of the individual characteristics include predisposing, enabling and proximal factors. Proximal factors reflect those most proximal to an individuals' decision to use either online or face-to-face services and include perceived risk of infection (need), as well as difficultly or ease attending a clinic (convenience)

and ease or difficulty of receiving a package in the post (privacy). Judgements of equity relating to these factors are made in relation to the theme they reflect (need, privacy and convenience). Trust in online services, trust in face-to-face services, subjective norms and privacy represent predisposing factors that influence access to services. Self-efficacy, health confidence, professional support and convenience represent enabling factors, while perceived risk of infection represents need for testing (Figure 9.3). Previous use of services represents the feedback of the outcome of service use on other factors, especially trust in online services, subjective norms and self-efficacy (Figure 9.3).

The results from the analysis in Chapter 9 indicate that the largest amount of variation in access is caused by trust in face-to-face services (aOR=1.25), a preference for professional support (aOR=0.82), not wanting to wait in a waiting room (convenience) (aOR=1.91) and concealing testing from people in the household (privacy) (aOR=0.16). Previous use of online services also had a large influence on use of online services (aOR=6.59), via feedback through improved trust in online services, increased normative beliefs and increased self-efficacy. Therefore, the variation in access to online services is caused by predisposing and enabling factors as well as factors associated with need. Each of these factors is discussed in relation to the conditions of equity define by the Andersen model and the WHO below.

Trust in online services, subjective norms and self-efficacy represent predisposing and enabling factors that influence access. Evidence presented in Chapter 9 indicates that the influence of these factors is confounded by previous use of online services. Therefore, as the service becomes more established, the effect of these factors is likely to weaken. This thesis investigates access to online services within a service context where face-to-face services are available as an alternative. The finding that these factors currently influence whether an individual takes a test for STI using an online service or a clinic service may reflect the difference in the characteristics of early adopters compared to late adopters of new services among service users. Therefore, assuming the effect of these does weaken over time, these differences can be judged as equitable differences in access to online services compared to face-to-face services.

Trust in institutions (face-to-face services) predisposes access to online services. Evidence presented in this thesis indicates that individuals that lack trust in face-to-face services are less likely to use online services compared to face-to-face services. Evidence within the literature indicates that individuals that lack trust in institutions are also less likely to access any preventative or diagnostic service [248, 252]. There is also evidence that institutional trust is lower among BME groups [63, 252]. In the UK, a lack of institutional trust among African migrants is a barrier to access to HIV services [63]. Evidence presented in this thesis indicates that differences in access caused by trust in face-to-face services are inequitable because they lead to social exclusion. Importantly, evidence from the literature indicates that a lack of trust in institutions is a barrier to accessing not just online services, but any service for testing. Therefore, further work is needed to develop services that enable access to this group.

Individuals that found it difficult to receive a STI testing kit in the post were much less likely to use online services for testing compared to clinic services. For each unit increase in difficulty in receiving a STI

package in the post (measured between 1 and 10) an individual was six times less likely to use online services for STI testing (aOR=0.16). This factor relates to concealing testing from others in the household, therefore reflects privacy. This had the largest influence on access to online testing services of the factors investigated in this thesis. Privacy around testing predisposes use of online services and living circumstances restrict choice of service for STI testing. Using the WHO criteria for judging equity of access, restricted choice reflects an inequitable reason for differences in access. Therefore, differences in access caused by difficulty receiving a package in the post reflect inequitable access. However, simple service adaptations to kit delivery methods could overcome this barrier to access.

Two factors that were significantly associated with access to online services after controlling for confounding related to convenience. Convenience, within Andersen's model reflects an enabling factor. Not wanting to wait in a clinic waiting room and finding it difficult to attend a clinic for testing were both facilitators of access to online services. These factors were both facilitators to access to online services. They reflect user choice and therefore differences in access to online services caused by them can be deemed as equitable.

A preference for professional support during testing remained an influence of access to online services after adjusting for confounding while self-efficacy did not. This is encouraging, suggesting a preference for professional support reflects user choice, regardless of self-efficacy test online. The scale for professional support contained four items relating to:

- how a professional eases anxiety
- a professional gives specific advice
- a professional helping to take samples
- how appropriate it is to test without having a professional present

This factor may reflect both predisposing attitudes and beliefs about testing as well as enabling personal costs of using the service where there is no contact with a health professional. Using the WHO criteria for judging equity, differences that are a result of user choice reflect equitable differences in access. However, this scale may reflect both personal choice and health confidence when self-testing. If health confidence is acting as a barrier to accessing online services, differences in access caused by this would represent inequitable differences in access. Caution should be taken when judging this factor as it may represent both equitable and inequitable differences in access. Further work is required to understand this factor in terms of whether it represents equitable or inequitable access to online services.

Finally, higher levels of perceived risk resulted in lower odds of using the online service compared to face-to-face services. Perceived risk of infection represents perceived need for testing. In a context where both online services and face-to-face services are available, this represents a fair and acceptable reason for differences in access. The online service therefore represents an appropriate service to test in when users perceive their risk to be low.

Implications

The implications of the findings of this PhD are threefold. Findings from this PhD should underpin development of online services to make them more widely accessible. Findings from this PhD should also inform commissioning of services. By understanding who accesses these services and why, commissioners can deliver a cost-effective service mix that targets higher-risk groups. Finally, findings from this PhD contribute to the existing literature relating to the barriers and facilitators to access of online services for STI self-sampling at home.

10.1 Implications for Online Service Developers

Following the rapid expansion of the provision of online services for STI self-sampling, the Faculty of Sexual and Reproductive Health (FSRH) and The British Association for Sexual Health and HIV (BASHH) have produced revised and updated standards that relate specifically to online services [338, 339]. These standards now state that it is the online providers responsibility to ensure that their services are accessible and inclusive to all those who need them. The findings presented in this thesis provide online service developers with guidance on which aspects of the service represent important barriers and facilitators to access. Furthermore, by going beyond the demographic factors influencing access, this thesis has identified factors influencing access that could be addressed by online service developers to change access. Some of the service characteristics influencing access identified in this thesis can be altered relatively quickly through changes to service delivery or design to improve access [104]. Other factors influencing are less amenable to changes in service design or delivery but may be addressed through health policy [104]. The potential for service developers to address each of these factors is discussed below.

The factor that had the largest influence on access to online services was how easy or difficult it was to receive a package in the post. Those who found it more difficult to receive a package in the post were much less likely to use the online service. Based on this evidence, the biggest effect service developers could have on access would be to design alternative options for kit delivery that do not require postal delivery such as package collection points. Service developers may also consider other features to improve privacy when testing or to reassure users of privacy when using the online service. This would likely increase access among younger users, who represent an important group in terms of risk of infection.

Service developers may consider providing more support for self-sampling within online services. Professional support relates to receiving personalised advice, receiving reassurance and support during self-sampling. Online service developers could consider alternative methods of delivering support to users and promoting the support that is already available to ensure users are aware of it. Improving the support available through the service, and users' awareness of the support available may increase use of the service. Increased use of the service, assuming users are satisfied with the service will result in higher levels of trust in the service, self-efficacy to self-sample and normative beliefs around testing online.

Importantly, future use of online services was predicted by previous use of online services. Therefore, online service developers should consider the importance of the factors identified as facilitators to access in this thesis when promoting online services to those that have previously used online services. Making users aware of links with established and trusted services will improve uptake of online services, particularly in the early stages of service delivery. Importantly, highlighting the benefits of not having to wait in a waiting room when promoting online services may encourage more potential users to try the service. Making potential users aware of the support available within the service may also improve use of online services among those that have not already used them. Service promotion should also consider the role of normative beliefs and trust in online services in improving use.

The factor identified in this that is least amenable to changes in service delivery or design is trust in face-to-face services (institutional trust). Willingness to trust the online service is related to the performance of the service [248, 252]. However, people with different experiences, personality types, and cultural backgrounds vary in their propensity to trust institutions [248]. Evidence from this thesis indicates that institutional trust is influencing access to online services. Further evidence from a UK based study indicates that trust in the accuracy of the self-test influences preferences for asymptomatic testing using online services [326]. Online service developers can implement changes to online services that improve trust in online services, however, they are not able to influence institutional trust in individuals. To address barriers to access to online services caused by institutional trust, further work is required to develop testing services that can reach those that lack institutional trust.

The difference seen between the findings of the observational study presented in Chapter 5 and the findings of the Gettested Trial suggest inequitable information about services may play a role in differences in access seen between groups. Service developers should develop a range of culturally appropriate methods of delivering information about services to different demographic groups to ensure equity of information delivery and service awareness.

Finally, findings from the scoping review presented in Chapter 3 highlight that different features of an online service interact with the population using the services. Online service developers should carefully design services and self-sampling methods in conjunction with the target population to ensure that services facilitate access to testing.

10.2 Implications for Commissioners

Ensuring any new innovation that is introduced to the service mix not only improves individuals' healthcare experience but also meets wider public health goals is essential [43, 96]. To meet public health goals the innovation must either enable access to higher-risk groups or improve efficiencies within services by shifting lower-risk groups to the innovation, freeing up clinic space for higher-risk groups. Understanding the factors that influence access to a new service innovation allows commissioners to understand how the introduction of a new service into the wider service mix may influence access to services within their context. Importantly, commissioners should avoid recreating barriers to access that already exist for face-

to-face services therefore creating larger inequities. The findings presented in this thesis describe who online services are accessible to and why and; when someone might choose to use online services and when they might choose to use face-to-face services. This thesis also presents evidence that access to online services will change over time, as the service becomes more established. The differences in access caused by trust in online service, normative beliefs about testing online and self-efficacy to self-sample are likely to reduce over time as more people gain experience using the service. This should be monitored as the service becomes more established, with special attention paid to individuals not accessing the online service at all.

Other factors influencing access to online services are not likely to change over time. Online services are accessed by individuals when they perceive their risk of STI infection to be lower. Those with higher perceived risk of infection access face-to-face services. Online services therefore shift lower risk users from face-to-face services. The same user may use online services when their perceived risk is low and face-to-face services when they perceive their risk to be high. This is an important finding as most previous literature refers to users as either online users or face-to-face users and does not consider the potential for the same user to access the services interchangeably, based on their circumstances at the time of testing.

However, enabling access to lower-risk users may also increase overall testing uptake within a population [336]. This may be an important shift for meeting public health goals as many people in the UK underestimate their risk of infection [335]. In additional, an observational study of service use before and after the introduction of SH:24 in Lambeth and Southwark found that the availability of SH:24 increased the total volume of testing done in the boroughs and increased the proportion of complex testing completed in clinic services [336]. Therefore, commissioning online services within an area where demand for sexual health service delivery outstrips supply will result in a shift of less complex testing to online services, but may also increase the volume of testing done.

Importantly, findings from this thesis indicate that online services are unlikely to remove barriers to access among those not already accessing services due to a lack of institutional trust. Therefore, online services do not provide a solution for access among those not accessing face-to-face services due to a lack institutional trust. A lack of institutional trust has been reported among BME minority groups in the UK [63]. BME groups represent an important group for STI testing as Black Caribbean and black other (non-African, non-Caribbean) populations have the highest diagnosis rates of STIs of all ethnic groups [14]. Special attention should be paid to developing and delivering services that address differences in access STI testing caused by a lack of institutional trust.

Online services also create inequitable barriers to access among those who wish to conceal testing from others. This is particularly important among young people who live with their parents. Young people are important populations for access to STI testing. Teenagers and young adults in England have the highest risk of chlamydia and gonorrhoea [14]. Alternative kit delivery options may overcome the barriers to use of

online services among young people. However, until these are available, online services will reinforce barriers to accessing STI testing among individuals who need to conceal testing from others.

When commissioning online services, commissioners should be mindful of the differences that exist between online services. Findings from Chapter 3 illustrate the large variation in types of services and service characteristics available for testing in out of clinic settings. The characteristics of the service interact with the characteristics of the individuals in the target population to influence service use. Therefore, commissioners should pay close attention to how the service was developed, whether it was developed with user input and, if so, the population that was consulted to develop services.

10.2.1.1 Online Services and Changing Context of Service Commissioning

Following successive funding cuts in 2015 and 2016 the budget for sexual and reproductive health in Lambeth and Southwark was significantly reduced [340]. Local commissioners carried out a public consultation survey that included more than 500 people over a three-month period in 2016 to propose changes to sexual health service delivery in the boroughs [217]. The result of this consultation was:

- the closure of three clinics in 2017
- update of two sexual health clinics so that they could provide more SRH services
- a change to hours of opening times in the remaining clinics
- the signposting of users attending for asymptomatic testing to SH:24[217]

Further changes took place when the London Sexual Health Transformation programme appointed the online service run by Preventex to deliver sexual health services across the 32 boroughs in London from 2018[341]. Following this appointment, SH:24 was no longer available to residents of Lambeth and Southwark free of charge. Therefore, the context of service delivery has changed considerably since this research was carried out. It is beyond the scope of this thesis to compare the characteristics of SH:24 and the service run by Preventex

The implications of the findings of this PhD thesis to the current context have become increasingly important considering these changes. Now that online services are available throughout London, the scale of the impact of these changes is larger. Signposting of asymptomatic clinic users to online services will increase the volume of users of online services. Higher levels of use should result in a reduction of the influence of trust in online services, subjective norms and self-efficacy on access to services and therefore reduce some of the differences seen between online and clinic users seen in early stages of service delivery. However, this will only improve among those that use the online service, assuming the new service delivers STI testing reliably and effectively. Additionally, among groups that do not use the service, this difference between users and non-users will widen.

By signposting asymptomatic clinic users online, individuals that lack institutional trust and those unable to conceal testing if they receive a postal package may avoid testing. In an observational analysis of service use following the implementation of signposting and in clinics, almost one third of individuals signposted to the online service (29.6%) did not complete a test using the online service [336]. This is a sizable proportion

of those triaged and should not be overlooked. It is possible that these users chose to use other face-to-face services to test. However, it is possible that many of these users did not test. Many STIs including HIV, syphilis, chlamydia and gonorrhoea are infectious and often asymptomatic, therefore actively signposting these users out of clinics without an appropriate alternative service for testing could have both significant negative impacts on equity of provision and unintentional consequences of increasing the prevalence of undiagnosed infection within the population.

10.3 Implications for Future Research

This thesis contributes to the academic literature on access to online services for STI self-sampling at home. It presents the first real-world look at access to an online service in the UK, develops a tool to measure the underlying factors influencing access and identifies the important factors influencing use of online services for STI self-sampling at home. This led to implications for online service-developers and for commissioners of services. However, it also highlights the need for further research work.

Importantly, by highlighting the importance of institutional trust in the use of online services, this thesis raises further questions about how to engage individuals that are not accessing either face-to-face services or online services. This is particularly important following the introduction of the London Sexual Health Programme. Further work should establish the barriers to use among non-users of both face-to-face and online services and further investigate the role of institutional trust in access to STI testing. Further development of STI testing innovations should focus on utilising this information to develop services that are accessible to these groups to avoid recreating larger inequities in access. Cultural competence of innovations should be established amongst target groups prior to development [342]. Following implementation of innovations, access should be carefully monitored to ensure the appropriate groups are accessing the service.

This thesis established that access to online services is likely to change over time, as the service becomes more established. Further research should continue to monitor access to online services to ensure that differences in access to online services between groups narrow, rather than widen over time. It should use the CMS tool developed in this thesis to measure the factors influencing access to online services to establish whether the influence of trust in online services, subjective norms and self-efficacy decreases over time. Special attention should be paid to those groups for whom access to online services does not improve over time, especially higher-risk groups who are difficult to access for research. Further work should establish why access to online services has not improved.

Further research should establish how changes to the wider context of sexual health service delivery influence access to online services. Specifically, in Lambeth and Southwark, how the changes to service delivery brought about by cuts to the sexual and reproductive health budget influences access to online services. Going beyond this, this work should also investigate the impact of the funding cuts on access to STI testing generally and the prevalence of infection within the population.

Finally, further research should continue to establish reliable and valid measures of the factors that influence access to online services for STI self-sampling at home. Specifically, future work should establish a valid measure of convenience for STI testing. In addition, further work should investigate the measure for professional support to understand whether the items in the measure reflect user choice, or health confidence.

Strengths and limitations

This thesis has many strengths. It uses mixed methods to evaluate access to online services for STI self-sampling at home in a real-world setting. By using a mixed-methods approach it identifies the underlying reasons for differences in access between groups. At the time of writing, this is the first research to look beyond demographic differences in access and measure the underlying factors that influence access in a real-world setting. By developing a measurement tool for these underlying factors from qualitative data, it measures the important latent factors that influence access to online services with high levels of face validity. By carrying out rigorous assessment of the validity and reliability of this tool within the target population, only those measures deemed appropriate for use as scales were analysed, avoiding misclassification bias. By identifying and measuring both latent and observable factors influencing access to online services, this thesis identifies the complex and multifaceted factors influencing access to online services for STI self-sampling at home [121]. It measures actual use of services and, by understanding the factors that influence actual use of services, accounts for potential use of services. At the time of writing, this thesis is the first study to measure individuals' use of online and face-to-face services over time. By doing this among a group of participants that have all be part of a trial, it captures the differences in access that do not result from differences in information delivery between groups.

Results presented in this thesis consider both the effect size as well as the p-value. By considering both, the effect size, alongside the p-value it avoids the potential for type I (false positive) and type II (false negative) errors that may arise as a result in different sample sizes and variation within samples [329]. In Chapter 5, where the sample size is large, resulting in a large number of statistically significant results, the effect sizes of the differences seen between groups are discussed in relation to the p-values obtained in analysis, with greater importance given to larger effect sizes. In Chapter 9, where the sample size is relatively small, effect sizes are discussed among factors with borderline significance to avoid type II error. Additionally, while this thesis does not carry out any clinical studies, the notion of clinical significance as a value judgement of the importance of the results is used throughout discussion of the results [343]. While no formal threshold for the importance of differences in access to services exist, value judgments of the importance of the relative effect size of each factor is discussed. By employing careful interpretation of results, this thesis avoids misinterpretation of statistical tests [329].

However, this thesis does have some weaknesses. This thesis did not investigate the factors that influence service use among individuals not using any service and may therefore fail to identify some important factors influencing non-use of online services. Non-user samples are crucial for understanding unmet need

within the population as well as service use because they differ from individuals that access services in terms of their health issues, behaviours, attitudes and decision-making [344]. Research presented in this thesis is limited to describing how factors influence access to services, but not how this may further impact on sexual health outcomes such as prevalence of infection within a population. The findings are therefore limited to describing the implications of the addition of online services on access to services, rather than on prevalence of infection. Additionally, because the studies within this thesis are carried out within the same context this thesis is unable to investigate the influence of contextual factors such as social and political contexts or to compare the effect of different service characteristics.

The study population used in Chapters 6 through 9 were drawn from the Gettested Trial population. The trial population did not reflect the general population of Lambeth and Southwark in terms of demographic composition. Notably, the proportion of young BME groups was lower in the trial population. As a result, findings in Chapter 6 may not reflect the true breadth of factors associated with use of online services. There may be additional factors that influence access to testing such access to technology, or digital literacy which were not identified in this thesis. Weighting of analyses in Chapter 9 was done to adjust for demographic differences, however, this could not address the potential narrow breadth of factors being tested. Further work should focus on access among young BME populations. Additionally, the Gettested Trial population are likely to be systematically different from the general population in Lambeth and Southwark because they would have a greater interest in STI testing [345] and may therefore lower levels of perceived stigma and shame around testing and higher levels of trust in services than the general population [346]. The population who were willing to take part in surveys for Chapters 8 and 9 were a subset of this population who had agreed to take part in future research. This sub-population may therefore have selected for individuals with even higher levels of trust, and engagement in sexual health service research than the trial population.

This thesis investigated the range of factors associated with to access to online services which were derived from data in qualitative interviews. While the breadth of factors investigated may have been limited by the sample population, the depth of investigation of each factor was limited by the approach to investigate a range of factors within the constraints of a PhD timeframe. For example, this PhD investigates the influence of perceived risk of infection, though it does not investigate the influence of worry, concern or symptoms and how they related to perceived risk of infection. Additionally, this thesis draws conclusions about the importance of equity of information delivery between groups, but it does not focus on service awareness, or how that information is received. Finally, this thesis investigates the effect of previous use of online services on future use of online services but does not identify whether it is service familiarity, trust, subjective norms, satisfaction or other factors contributing to use of online services.

The findings from Chapter 9 are likely to underestimate the true effect of trust, subjective norms, self-efficacy and health confidence within the general population. Furthermore, because trial participants were relatively young (aged between 18 and 30 years) compared to the general population the findings may overestimate the influence of privacy, particularly the influence of receiving a package in the post. The

differences between the trial population and the general population may account for why there was no difference in access between demographic groups seen in Chapter 9. Finally, due to limitations in the study size, Chapter 9 was unable to detect any influence of interaction between demographic variables and the factors influencing access to online services.

10.4 Strengths and Limitations of the application of Andersen's Model

Andersen's model provided a lens through which to view the findings of this thesis. It provided a backbone for the structure of the factors that influence access to online services for STI self-sampling at home and helped to highlight the theoretical differentiation of the factors relating to the individual and the factors relating to the service. This theoretical differentiation helped to identify practical solutions and policy implications with the findings. The model facilitated in the organisation of each factor that was identified and placed them within the wider landscape of factors that influence access using categories of predisposing, enabling and need. The feedback loops within the model illustrated the mechanism of action for the finding of the influence of previous use of online services on future use of online services.

However, the model did have its limitations in the application within this thesis. Notably, the model clearly differentiates the characteristics of the individual from the characteristics of the context and service. While this is an important theoretical differentiation, in practice, these factors were more representative of the continuum of the fit between the service and the user. The model is developed to evaluate access to services, rather than to compare access between two services. Therefore, the role of need within the model had to be adapted to reflect this. Finally, the feedback arrows within the model indicate the interaction between predisposing, enabling and need factors, but not the interactions within each of these categories. The data from this thesis indicates interaction within predisposing, enabling and need factors.

Reflection

This section reflects on what I would have done differently if I was given the opportunity to complete this PhD again. Like any PhD, this thesis was carried out under financial and time constraints as well as expectations of funding bodies and supervisors. Should my second chance to complete this thesis be in the absence of both time and financial constraints, I would focus on recruitment of a population more reflective of the local population accessing sexual health services in Lambeth and Southwark. This sample would be sufficiently large to investigate between subgroup differences. I would investigate how the factors that influence use of online services differ between groups so that strategies to reduce inequities in access can be specific for important groups. I would also have the time to further develop measurement the scales developed in this thesis to differentiate important factors underlying influences of access of online services. Should I have my chance to complete this PhD without any expectations from funders or supervisors, I would have focused on measure development.

However, this, hypothetical world is not a reality. In reality, a PhD is a journey on which a student develops throughout. Therefore, reflecting upon the journey that I took, there are aspects of this PhD that I would do

differently, now as a result of the learning that has taken place. I would take more time with qualitative data collection and qualitative analysis to explore in more depth the contextual characteristics, health behaviours and outcomes of service use and their influence on access to online services. By doing this, I would be able to present results that are not limited to the individual factors that influence access to online services. In line with this, I would have spent more time developing themes, particularly the theme around convenience so that more robust conclusions on the influence of convenience could be made.

Conclusion

Online services are now an integral part of STI testing service delivery in London. The findings presented in this thesis describe access to online services and identify the important factors that influence use of online services for STI self-sampling at home. The findings from this thesis should be used by service developers to adapt services to improve access to online services. Service commissioners should use these findings to understand who online services facilitate access to, and who they do not. Finally, the findings from this thesis should be used by researchers in the field of sexual health to inform future research into online services for STI self-sampling at home.

APPENDICES

Appendix A Search Strategy

Databases	Pubmed and web of science
Restrictions	Restricted to humans and English
Dates	18.01.2017
Strategy	#1 and #2 and #3 and #4
#1	“online") OR "internet") OR "web based") OR "website") OR internet*) OR "internet based")
#2	"post" OR "postal
#3	("sample") OR "sampling") OR sampl*) OR "test") OR "testing") OR test*) OR "test kits") OR "testing kits") OR "sample kits") OR "sampling kits") OR "test kit") OR "testing kit") OR "sample kit") OR "sampling kit"))) OR (("home")
#4	"sti") OR "stis") OR "sexually transmitted infection") OR "sexually transmitted infections") OR "std") OR "stds") OR "sexually transmitted disease") OR "sexually transmitted diseases") OR "chlamydia") OR "gonorrhoea") OR "syphilis") OR "hiv")

Search pubmed=356

Web of science = 275

Total = 631

Appendix B Characteristics of Studies Tables

Ahmed-Little 2016

Study methodology	A pilot study of a HIV self-sampling service descriptive
Participants	Users of the RUClear website who ordered a HIV self-sampling test (Greater Manchester)
Time-period	June 2011 to December 2012
STI	HIV
Type of service	RUClear website
Delivery method	Not stated
Kit type	DBS self-sampling for HIV
Return of kit method	Postal
Results	Automated phone call or SMS
Treatment available	No
Partner notification	Not stated
Cost to user	No
Study objective	Acceptability, feasibility, sustainability, clinical and cost-effectiveness of the pilot
Notes	

Aicken et al 2016

Study methodology	Qualitative interview study of a hypothetical service
Participants	25 sexually-experienced 16–24-year olds, recruited from Further Education colleges in an urban, high STI prevalence area. Inner-London
Time-period	2012
STI	Chlamydia
Type of service	A smartphone enabled STI self-testing device, linked with online clinical care pathways for treatment, partner notification, and disease surveillance, is being developed by the eSTI2 consortium Hypothetical service
Delivery method	Not described
Kit type	Self-testing
Return of kit method	n/a- self-testing
Results	Test message
Treatment available	Yes – online consultation and e-prescription
Partner notification	Yes
Cost to user	No
Study objective	*Young people's perceptions of smartphone-enabled self-testing and online care for sexually transmitted infections*

Notes	

Alexander 2008

Study methodology	Cross-sectional survey descriptive
Participants	MSM attending a single GUM clinic in Brighton, UK
Time-period	2005—2007
STI	Chlamydia and Gonorrhoea
Type of service	In clinic self-swab
Delivery method	In clinic self-swab
Kit type	n/a
Return of kit method	In clinic na/
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	n/a
Study objective	Acceptability of self-sampling
Notes	

Baraitser 2015

Study methodology	Theory of change
Participants	Interview participants: Local clinicians, senior clinic managers, senior local health commissioners, potential service users.
Time-period	2013
STI	HIV, syphilis, chlamydia, gonorrhoea
Type of service	Hypothetical online service
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Postal
Results	SMS
Treatment available	yes
Partner notification	Not stated
Cost to user	No
Study objective	To generate theory to support development of a service
Notes	

Bavinton 2013

Study methodology	An online cross-sectional questionnaire was conducted with 2,306 Australian gay men Hypothetical service. descriptive

Participants	Men that homosexually identified or had had sex with another man in the previous year, and they lived in Australia
Time-period	during 2009
STI	HIV
Type of service	Hypothetical
Delivery method	Not stated
Kit type	Self-testing
Return of kit method	n/a
Results	n/a
Treatment available	No
Partner notification	Not stated
Cost to user	Not yet known
Study objective	Perceptions of use
Notes	

Bracebridge 2012

Study methodology	Cross-sectional study comparative
Participants	Individuals aged between 18 and 24 years within the North East Essex Primary Care Trust, were
Time-period	1 December 2008 and 31 January 2009
STI	Chlamydia
Type of service	*Systematic postal screening and treatment service for genital Chlamydia trachomatis,* Access via the internet. All eligible people were sent kits with information on how to register online
Delivery method	Postal
Kit type	Self-sampling Urine collection
Return of kit method	Self-addressed pre-paid envelope
Results	by mobile phone text or other preferred method of contact, that the result was available. Individuals then logged back into their record. If their result was positive, they completed an online clinical questionnaire and specified to which address they would like their treatment posted
Treatment available	Yes
Partner notification	Yes
Cost to user	No
Study objective	Associations between test uptake and positivity, and individuals' personal characteristics, were examined.

	The efficacy of partner notification was estimated costs of screening were compared with the national average.
Notes	

Bull 2015

Study methodology	Cross-sectional data analysis comparative
Participants	Users of home sampling offered an informed choice between blood and saliva sampling
Time-period	From August 2013
STI	HIV
Type of service	Home sampling
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Postal
Results	Not stated
Treatment available	n/a
Partner notification	Not stated
Cost to user	Not stated
Study objective	l HIV home sampling requests and analysed any differences in demographics and return rates for both blood and saliva samples
Notes	Poster presentation

Chai 2011

Study methodology	Cross-sectional analysis of data from an online service descriptive
Participants	1644 Men aged 14 and over in the Baltimore (Maryland) USA
Time-period	September 2006 and May 2009
STI	Chlamydia, Gonorrhoea and Trichomonas
Type of service	Online service targeting higher-risk groups
Delivery method	Postal
Kit type	Self-Collected Urine and Urethral Swab Kit
Return of kit method	Not stated
Results	Participant phoned a toll-free number
Treatment available	Results faxed to a treatment clinic
Partner notification	Not stated
Cost to user	Free
Study objective	Risk factors for infection among men
Notes	

Chiu 2016

Study methodology	Cross-sectional descriptive
Participants	be male, (2) be 18 years or older, (3) be Los Angeles residents, (4) be registered and unique Facebook users (verified using the “Facebook Connect” technology), and (5) have had sex with a man in the past 12 months. Approximately 80% of the participants were recruited online and 20% offline. Title suggests African and Latino, but inclusion criteria does not.
Time-period	August 2010 to January 2011
STI	HIV
Type of service	None- home test could be requested from the study team
Delivery method	Post
Kit type	Home test (not explicitly stated)
Return of kit method	Not stated
Results	Not stated
Treatment available	n/a
Partner notification	Not stated
Cost to user	Free
Study objective	to determine the correlates of requesting home HIV test kits among a sample of MSM social media users
Notes	

Elliot 2015

Study methodology	Cross-sectional descriptive
Participants	MSM in the UK
Time-period	2013
STI	HIV
Type of service	Users invited to assess their HIV risk through messages or promotional banners on gay SNS. Offered a free test regardless of risk.
Delivery method	postal
Kit type	postal HIV oral fluid or blood self-sampling kit
Return of kit method	postal
Results	SMS and phone
Treatment available	n/a
Partner notification	Not stated
Cost to user	free
Study objective	determine the HIV risk behaviour of users, the uptake of offer of home sampling and the acceptability of the service.
Notes	

Fajardo-Bernal 2015

Study methodology	Systematic review
Participants	Sexually active people
Time-period	Evidence is up to May 2015.
STI	Chlamydia and Gonorrhoea
Type of service	No service- just an assessment of home-based specimen collection
Delivery method	n/a
Kit type	Self-sampling, FCU and swabs for both men and women
Return of kit method	n/a
Results	n/a
Treatment available	Yes
Partner notification	n/a
Cost to user	n/a
Study objective	To assess the effectiveness and safety of home-based specimen collection as part of the management strategy for *Chlamydia trachomatis* and *Neisseria gonorrhoeae* infections compared with clinic-based specimen collection in sexually active people.
Notes	

Figueroa 2015

Study methodology	Literature review
Participants	men who have sex with men (MSM), sex workers (SW), people who inject drugs (PWID), transgender people and people in prisons or closed settings)
Time-period	January 1995 and July 2014.
STI	HIV
Type of service	n/a
Delivery method	n/a
Kit type	Self-testing
Return of kit method	n/a
Results	n/a
Treatment available	No
Partner notification	n/a
Cost to user	n/a
Study objective	Attitudes and Acceptability on HIV Self-testing
Notes	

Frye 2015

Study methodology	Qualitative study of hypothetical access to HIV self-tests

Participants	Report being male at birth; (2) self-identify as black, African American, Caribbean black, African black, or multi-ethnic black; (3) be able to read and respond in English; (4) be between 16–29 years of age; (5) not be known to be HIVinfected; (6) report insertive or receptive anal intercourse with a man or transwoman in the last 12 months; (7) reside in the NYC metropolitan area; and (8) provide informed consent or assent for the study.
Time-period	February–May 2014)
STI	HIV
Type of service	No service- the availability of test kits
Delivery method	n/a
Kit type	Self-test
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	yes
Study objective	Barriers and facilitators to HIV self-testing
Notes	

Gaydos 2006

Study methodology	Cross-sectional descriptive
Participants	Females over 14 years, not attending a clinic in Maryland Baltimore USA
Time-period	July 2004 and January 2005
STI	Chlamydia
Type of service	Online service
Delivery method	Postal or pick up location
Kit type	Self-Administered Vaginal Swabs
Return of kit method	Postal
Results	Toll free phone call
Treatment available	Results faxed to a clinic
Partner notification	Not stated
Cost to user	Free
Study objective	Descriptive of users
Notes	

Gaydos 2006 b

Study methodology	Qualitative
Participants	Women in Baltimore, Maryland
Time-period	Not stated

STI	Chlamydia
Type of service	Internet based
Delivery method	Not stated
Kit type	Self-sampling
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Free
Study objective	To ascertain the opinions, concerns and perceptions of sexually active women to guide the development of an internet-based chlamydia outreach and screening program
Notes	Abstract only

Gilbert 2013

Study methodology	Cross-sectional descriptive (hypothetical service)
Participants	Participants from the 2011-12 cycle were recruited through dating/sex-seeking websites (6356/8388, 75.8%), gay/bisexual community-based organizations (833/8388, 10.0%), and word-of-mouth (729/8388, 8.7%).
Time-period	2011-2012
STI	HIV/STI
Type of service	Not stated
Delivery method	Not stated
Kit type	Self-testing and self-sampling
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Not stated
Study objective	intention to use Internet-based STI/HIV testing
Notes	

Gkatzidou 2015

Study methodology	Qualitative study on an online Chlamydia clinical care pathway (hypothetical)
Participants	Two age-stratified samples (16 to 18 and 19 to 24-year olds) of young people from Further Education colleges and Higher Education establishments in London and north East England
Time-period	2013

STI	Chlamydia
Type of service	e-STi mobile app offering testing and treatment – study focused on the chlamydia clinical care pathway
Delivery method	n/a
Kit type	n/a
Return of kit method	n/a
Results	System notifications
Treatment available	Yes
Partner notification	Yes
Cost to user	No
Study objective	Design recommendations
Notes	

Greacen 2012

Study methodology	Cross-sectional. Online questionnaire on sex websites and gay and HIV community websites. descriptive
Participants	Internet-using French-speaking men who have sex with men. Respondents were men aged 18 years or more who were users of the websites in question and who chose to answer the proposed online questionnaire
Time-period	3 February to 29 April 2009
STI	HIV
Type of service	Unauthorised online HIV self-tests (generally)
Delivery method	n/a
Kit type	HIV self-tests
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	n/a
Study objective	Having accessed a self-test
Notes	

Greacen 2013

Study methodology	Cross-sectional survey of hypothetical service comparative
Participants	MSM
Time-period	February to April 2009
STI	HIV

Type of service	Online order of kit
Delivery method	Not stated
Kit type	Self-test
Return of kit method	n/a
Results	n/a
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Yes
Study objective	Interest in accessing self-tests
Notes	

Greenland 2011

Study methodology	Cross-sectional survey comparative
Participants	16- to 29-year-old participants and nonparticipants in the first year of a Chlamydia Screening Implementation program in the Netherlands
Time-period	Not stated
STI	chlamydia
Type of service	Internet based screening with invitation letter
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Not stated
Results	Internet
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Not stated
Study objective	*Acceptability of the internet-based Chlamydia screening implementation in the Netherlands and insights into nonresponse*
Notes	

Grispen 2011

Study methodology	Cross-sectional surveys of intention comparative (hypothetical)
Participants	513 self-testers and 600 non-testers. Individuals aged 12 years or older who have an e-mail address in Holland
Time-period	Not stated
STI	HIV
Type of service	n/a
Delivery method	Not stated
Kit type	Self-test
Return of kit method	Not stated

Results	Not stated
Treatment available	n/a
Partner notification	Not stated
Cost to user	Not stated
Study objective	Psychosocial determinants of self-testing for cholesterol, glucose, and HIV
Notes	

Jamil 2013

Study methodology	Systematic review
Participants	individuals who agreed to receive home-collection kits or postal test kits (PTKs) on invitation, requested PTKs through the internet or phone, picked-up PTKs from designated locations, or completed a questionnaire in screening program.
Time-period	Jan 2005 – 2013
STI	Chlamydia and Gonorrhoea
Type of service	CT or CT and NG screening program with self-collected specimens at home and reported the number of tests. For studies in more than one setting, only home-based screening data were included. RCTs were included, with the data from home-testing arm only.
Delivery method	Any
Kit type	Self-sampling
Return of kit method	Any
Results	Any
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Any
Study objective	systematically reviewed the strategies and outcomes of home-based CT/NG screening programs.
Notes	

Krause 2013

Study methodology	Systematic Literature Review
Participants	Not stated
Time-period	between 1998 and October 2012
STI	HIV
Type of service	n/a
Delivery method	n/a
Kit type	Self-testing, home sample collection tests with performance of standard Western blot and real self-tests based on blood or saliva rapid tests

Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	n/a
Study objective	Acceptability of HST
Notes	

Kuder 2015

Study methodology	Cross-sectional descriptive
Participants	Users of the Iwantthekit website
Time-period	September 2013 through February 2014
STI	Chlamydia, Gonorrhoea and Trichomonas
Type of service	Online service
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Postal
Results	Internet automated, phone call, SMS
Treatment available	No referred to clinic
Partner notification	Not stated
Cost to user	no
Study objective	Characteristics of users
Notes	

Kwan 2012

Study methodology	Cross-sectional descriptive
Participants	West Australia. Participants must be 16 years, have a mobile telephone number, access to the internet and a printer, and be able to visit a PathWest Laboratory Medicine WA
Time-period	2010 to June 2011
STI	Chlamydia
Type of service	Online risk assessment and test order form
Delivery method	Participant visits a specimen collection centre
Kit type	Self-sampling
Return of kit method	n/a
Results	Users phone a toll-free number
Treatment available	registered nurse from the B2 Clinic contacts participants who have a positive chlamydia and/or gonorrhoea test result using the mobile

	telephone number provided by the participant and advises them to visit a doctor for antibiotic treatment. W
Partner notification	Yes
Cost to user	no
Study objective	To evaluate data from an online chlamydia testing program (OLC) developed to increase young people's access to testing for chlamydia, the most commonly notified disease in Australia and Western Australia, with a high proportion of notifications among young people (< 30 years). Number and proportion of downloaded pathology forms that resulted in a test; demographic characteristics of participants; prevalence of chlamydia; completeness and timeliness of follow-up of positive test results; and participant satisfaction.
Notes	

Lorimer 2013

Study methodology	Qualitative Study of hypothetical service
Participants	15 focus groups with 60 heterosexual young men (aged 16-24 years) across central Scotland, drawn across age and socioeconomic backgrounds
Time-period	Not stated
STI	Chlamydia
Type of service	Postal screening with invitations to use a website
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Not stated
Study objective	Explores young men's views towards the barriers and facilitators of implementing an Internet-based screening approach. The study sought to consider ways in which the proposed intervention would reach and engage men across ages and socioeconomic backgrounds.
Notes	

O'Connor 2016

Study methodology	Systematic review of qualitative studies
Participants	Any individual (adult or child). This includes patients, the public and health professionals who would be aware of the experiences of these groups.

Time-period	2000 to 2016
STI	n/a
Type of service	Web-based interventions on personal computers (PCs) or mobile platforms, • Mobile health applications or apps, • Patient portals or personal health records, • Interventions delivered by short message service (SMS) or interactive voice recognition (IVR). Hypothetical or in development
Delivery method	n/a
Kit type	n/a
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	n/a
Study objective	Factors affecting patient and public engagement and recruitment to digital health interventions
Notes	

Rompalo 2013

Study methodology	qualitative study, hypothetical service
Participants	attendees of STI and adolescent health centres in Baltimore, Maryland, and Cincinnati, Ohio aged 18 years or older
Time-period	March 2008 and April 2009.
STI	All
Type of service	Not stated
Delivery method	Not stated
Kit type	Not stated
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	n/a
Study objective	advantages and disadvantages of having a POCT, perceived barriers to using POCTs in the clinic setting and at home, priorities for the development of new POCTs for STIs, and envisioned characteristics of an ideal POCT
Notes	

Ronda 2012

Study methodology	Cross-sectional survey of intention to use comparative
Participants	Internet panel
Time-period	2006
STI	Chlamydia
Type of service	Not stated
Delivery method	Not stated
Kit type	Self-test (self-sample)
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Not stated
Study objective	Intention to test
Notes	Abstract only

Powel 2015

Study methodology	Online cross-sectional survey (hypothetical service) comparative
Participants	Participants were recruited to an online survey using a Google AdWord UK-based individuals who used Google to actively search for keywords related to chlamydia
Time-period	18 March 2011 to 11 January 2012
STI	Chlamydia
Type of service	Self-testing (sampling) (hypothetical)
Delivery method	Not stated
Kit type	Not stated
Return of kit method	Not stated
Results	Not stated
Treatment available	Not stated
Partner notification	Not stated
Cost to user	Not stated
Study objective	Intention to test for chlamydia in the context of (a) self-testing and (b) being tested by an HCP?
Notes	

Sharma 2014

Study methodology	Cross-sectional descriptive (hypothetical service)

Participants	internet-using men who have sex with men. being reportedly male, 18 years of age or older, currently residing within the US, and having at least one male sex partner in the past 6 months
Time-period	October to November 2012
STI	HIV
Type of service	n/a
Delivery method	n/a
Kit type	Self-testing and self-sampling
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	yes
Study objective	Acceptability and intended usage preferences for six HIV testing options
Notes	

Smith 2016

Study methodology	Cross-sectional survey of RCT participants descriptive
Participants	200 women, 200 heterosexual men, 200 MSM in Australia
Time-period	2011-2013
STI	Chlamydia
Type of service	Home-based chlamydia retesting strategy
Delivery method	postal
Kit type	Swabs and urine collection
Return of kit method	Postal
Results	SMS
Treatment available	Visit clinic for treatment
Partner notification	Not stated
Cost to user	No
Study objective	Acceptability and cost
Notes	

Spielberg 2014

Study methodology	Feasibility study descriptive
Participants	Women living in San Francisco Bay area counties in California: Alameda, Contra Costa, San Francisco, and San Mateo aged 18-30 years
Time-period	April 2012- June2012
STI	chlamydia, gonorrhea, and trichomoniasis

Type of service	Advertisted website offering testing of self-collected vaginal swabs for chlamydia, gonorrhea, and trichomoniasis; e-prescriptions; e-partner notification; and data integration with clinic electronic health records
Delivery method	Postal
Kit type	Vaginal swabs
Return of kit method	Pre-paid return envelope
Results	Online
Treatment available	e-prescriptions
Partner notification	Yes
Cost to user	No- study
Study objective	Acceptability, feasibility and cost
Notes	

Tebb 2004

Study methodology	Cross-sectional Follow-up survey of adolescent's attitudes to different sampling techniques. descriptive
Participants	Sexually active adolescent females attending either a university- or health maintenance organization-based teen clinic in Northern California. 13–20-years-old
Time-period	1999-2000
STI	Chlamydia
Type of service	n/a
Delivery method	n/a
Kit type	first void urine (FVU), self-collected vaginal swab, and clinician-collected endocervical swabs during a pelvic examination
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	n/a
Study aim or objectives	To assess sexually active adolescent females' attitudes of home tests for sexually transmitted infections
Notes	

Van der Helm 2009

Study methodology	Cross-sectional descriptive

Participants	Clients of the Amsterdam and South Limburg STI outpatient clinics reporting receptive anal intercourse were asked to fill out a questionnaire and provide SRS
Time-period	2006-2007
STI	Chlamydia and Gonorrhoea
Type of service	In clinic self-swab
Delivery method	n/a
Kit type	Self-sampling
Return of kit method	n/a
Results	n/a
Treatment available	n/a
Partner notification	n/a
Cost to user	No
Study objective	Performance and acceptability of self-collected rectal swabs
Notes	

Witzel 2016

Study methodology	Qualitative study of hypothetical self-testing
Participants	Gay, bisexual and other men who have sex with men (MSM) including trans men who were over the age of 18 and did not have diagnosed HIV were eligible for inclusion in this study.
Time-period	July and November 2015
STI	HIV
Type of service	None- perceived benefits of HIV self-testing
Delivery method	None
Kit type	Self-testing
Return of kit method	None
Results	n/a
Treatment available	n/a
Partner notification	Not stated
Cost to user	Yes
Study objective	Perceptions of HIV self-testing
Notes	

Woodhall 2012

Study methodology	Cross-sectional descriptive

	We analysed NCSP chlamydia testing data (2006–2010) for 15–24-year olds from the 71/95 programme areas in England where site codes were available to identify tests ordered through the internet.
Participants	15–24-year olds in the UK
Time-period	2006–2010
STI	Chlamydia
Type of service	Screening tests ordered through the internet
Delivery method	Postal
Kit type	Self-sampling
Return of kit method	Postal
Results	Text message
Treatment available	Not described
Partner notification	Not described
Cost to user	Both types of services included
Study objective	Descriptive. Number and proportion of tests by different demographic characteristics
Notes	

Appendix C: Internet -accessed STI testing and results service: A randomised, single blind, controlled trial

PLOS | MEDICINE

RESEARCH ARTICLE

Internet-accessed sexually transmitted infection (e-STI) testing and results service: A randomised, single-blind, controlled trial

Emma Wilson[1]*, Caroline Free[1‡], Tim P. Morris[2], Jonathan Syred[3], Irrfan Ahamed[1], Anatole S. Menon-Johansson[4], Melissa J. Palmer[1], Sharmani Barnard[3], Emma Rezel[3], Paula Baraitser[3,5‡]

1 Faculty of Epidemiology and Population Health, London School of Hygiene & Tropical Medicine, London, United Kingdom, 2 Medical Research Council Clinical Trials Unit at UCL, London, United Kingdom, 3 King's Centre for Global Health and Health Partnerships, School of Population Health & Environmental Sciences, King's College London, London, United Kingdom, 4 Burrell Street Sexual Health Clinic, Guy's and St Thomas' NHS Foundation Trust, London, United Kingdom, 5 Department of Sexual Health and HIV, King's College Hospital NHS Foundation Trust, London, United Kingdom

‡ These authors are joint senior authors on this work.
* emma.wilson@lshtm.ac.uk

Citation: Wilson E, Free C, Morris TP, Syred J, Ahamed I, Menon-Johansson AS, et al. (2017) Internet-accessed sexually transmitted infection (e-STI) testing and results service: A randomised, single-blind, controlled trial. PLoS Med 14(12): e1002479. https://doi.org/10.1371/journal.pmed.1002479

Academic Editor: Nathalie Broutet, World Health Organization, SWITZERLAND

Received: August 10, 2017

Accepted: November 23, 2017

Published: December 27, 2017

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Funding: Guy's and St Thomas' Charity funded the study (grant number MAJ120505). PB was the principal grant holder. EW, JS, IA, SB, ER, CF were also supported by this grant. https://www.gsticharity.org.uk/. TPM was supported by the Medical Research Council (grant numbers MC_UU_12023/21 and MC_UU_12023/29).

Abstract

Background

Internet-accessed sexually transmitted infection testing (e-STI testing) is increasingly available as an alternative to testing in clinics. Typically this testing modality enables users to order a test kit from a virtual service (via a website or app), collect their own samples, return test samples to a laboratory, and be notified of their results by short message service (SMS) or telephone. e-STI testing is assumed to increase access to testing in comparison with face-to-face services, but the evidence is unclear. We conducted a randomised controlled trial to assess the effectiveness of an e-STI testing and results service (chlamydia, gonorrhoea, HIV, and syphilis) on STI testing uptake and STI cases diagnosed.

Methods and findings

The study took place in the London boroughs of Lambeth and Southwark. Between 24 November 2014 and 31 August 2015, we recruited 2,072 participants, aged 16–30 years, who were resident in these boroughs, had at least 1 sexual partner in the last 12 months, stated willingness to take an STI test, and had access to the internet. Those unable to provide consent and unable to read English were excluded. Participants were randomly allocated to receive 1 text message with the web link of an e-STI testing and results service (intervention group) or to receive 1 text message with the web link of a bespoke website listing the locations, contact details, and websites of 7 local sexual health clinics (control group). Participants were free to use any other services or interventions during the study period. The primary outcomes were self-reported STI testing at 6 weeks, verified by patient record checks, and self-reported STI diagnosis at 6 weeks, verified by patient record checks. Secondary outcomes were the proportion of participants prescribed treatment for

Appendix D REC Approval for epidemiological evaluation of SH:24

NRES Committees - North of Scotland
Summerfield House
2 Eday Road
Aberdeen
AB15 6RE

Telephone: 01224 558458
Facsimile: 01224 558609
Email: nosres@nhs.net

NHS Grampian

8 April 2015

Dr Paula Baraitser
Consultant in Sexual Health Medicine
King's College Hospital
Camberwell Building
94-104 Denmark Hill
LONDON
SE5 9RS

Dear Dr Baraitser

Study title:	**Economic and epidemiological evaluation of SH:24, a redesigned complete sexual health service**
REC reference:	**15/NS/0031**
IRAS project ID:	**169251**

The Proportionate Review Sub-Committee of the NRES Committees - North of Scotland (1) reviewed the above application by correspondence.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this favourable opinion letter. The expectation is that this information will be published for all studies that receive an ethical opinion but should you wish to provide a substitute contact point, wish to make a request to defer, or require further information, please contact the REC Manager Mrs Carol Irvine, nosres@nhs.net. Under very limited circumstances (e.g. for student research which has received an unfavourable opinion), it may be possible to grant an exemption to the publication of the study.

Ethical opinion

On behalf of the Committee, the Proportionate Review Sub-Committee gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database. This should be before the first participant is recruited but no later than 6 weeks after recruitment of the first participant.

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to request a deferral for study registration within the required timeframe, they should contact hra.studyregistration@nhs.net. The expectation is that all clinical trials will be registered, however, in exceptional circumstances non registration may be permissible with prior agreement from NRES. Guidance on where to register is provided on the HRA website.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion").

Approved documents

The documents reviewed and approved were:

Document	*Version*	*Date*
IRAS Checklist XML: Checklist 24032015		24 March 2015
Peer Review		28 October 2014
REC Application Form: REC Form 24032015		24 March 2015
Research protocol or project proposal	1	23 January 2015
Summary CV for Chief Investigator (CI): Paula Baraitser		22 July 2014

Membership of the Proportionate Review Sub-Committee

The members of the Sub-Committee who took part in the review are listed on the attached sheet.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

User Feedback

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website:
http://www.hra.nhs.uk/about-the-hra/governance/quality-assurance/

HRA Training

We are pleased to welcome researchers and R&D staff at our training days – see details at http://www.hra.nhs.uk/hra-training/

With the Committee's best wishes for the success of this project.

15/NS/0031	**Please quote this number on all correspondence**

Yours sincerely

Professor Helen Galley
Chair

Enclosures: List of names and professions of members who took part in the review
"After ethical review – guidance for researchers" SL-AR2

Copy to: The Research Office, King's College Hospital NHS Foundation Trust

NRES Committees - North of Scotland (1)

Attendance at PR Sub-Committee of the REC meeting by correspondence

Committee Members:

Name	*Profession*	*Present*	*Notes*
Dr John Callender	Vice-Chair & Associate Medical Director	Yes	
Mrs Diane Fleming	Retired Clinical Trials Co-ordinator	Yes	
Dr Katie Gillies	Postdoctoral Research Fellow	Yes	

Also in attendance:

Name	*Position (or reason for attending)*
Mrs Carol Irvine	Senior Ethics Co-ordinator

Appendix E REC Approval for Substantial Amendment 6 of 14/LO/1477

NHS
Health Research Authority

NRES Committee London - Camberwell St Giles
Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Tel: 0117 342 1391

03 September 2015

Emma Wilson
Department of Population Health
London School of Hygiene and Tropical Medicine
Keppel Street, London,
WC1E 7HT

Dear Ms Wilson,

Study title:	**Can Internet-based sexual health services increase diagnoses of sexually transmitted infections compared to face-to-face services? Evaluation of an Internet-based sexual health service in Lambeth and Southwark.**
REC reference:	**14/LO/1477**
Amendment number:	**Substantial Amendment 6 - 17.08.15**
Amendment date:	**17 August 2015**
IRAS project ID:	**159386**

The above amendment was reviewed at the meeting of the Sub-Committee held on 28 August 2015 in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Recommendations

The Sub-Committee made the following recommendation:

1. The Sub-Committee suggests that under the paragraph headed "Who has reviewed this Trial?" on the Patient Information Sheet, the name of the Camberwell St Giles Research Ethics Committee should be stated.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Interview schedules or topic guides for participants [Interview topic guide v1 14.08.15]	1	14 August 2015
Letters of invitation to participant [Invitation letter v1 14.08.15]	1	14 August 2015
Non-validated questionnaire [Survey v1 17.08.15]	1	17 August 2015

NRES Committee London - Camberwell St Giles

Attendance at Sub-Committee of the REC meeting on 28 August 2015

Committee Members:

Name	*Profession*	*Present*	*Notes*
Mr John Richardson (Chair)	Retired Director of COREC: former Ecumenical Officer for Churches Together in South London	Yes	
Evan Stone QC		Yes	

Also in attendance:

Name	*Position (or reason for attending)*
Miss Claudia Harrison	REC Assistant

Notice of Substantial Amendment (non-CTIMP) [Amendment 6 17.08.15]		17 August 2015
Participant consent form [Consent interview v.1 11.08.15 2015]	1	11 August 2015
Participant consent form [Consent survey v.1 11.08.15]	1	11 August 2015
Participant information sheet (PIS) [PIS Interview v.1 11.08.15]	1	11 August 2015
Participant information sheet (PIS) [PIS Survey v.1 11.08.15]	1	11 August 2015
Research protocol or project proposal [MvP1 protocol v9 14.08.15]	9	14 August 2015

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

14/LO/1477:	**Please quote this number on all correspondence**

Yours sincerely

Pp

Mr John Richardson
Chair

E-mail: nrescommittee.london-camberwellstgiles@nhs.net

Enclosures: *List of names and professions of members who took part in the review*

Copy to: *Dr Paula Baraitser*
The Research Office, Kings College Hospital NHS Foundation Trust

Appendix F REC Approval for Substantial Amendment 8 to 14/LO/1477

London - Camberwell St Giles Research Ethics Committee

Level 3, Block B
Whitefriars
Lewins Mead
Bristol
BS1 2NT

Tel: 02071048055

31 May 2016

Dr Paula Baraitser
Weston Education Centre
Cutcombe Road
Denmark Hill
SE5 9RJ

Dear Dr Baraitser

Study title:	**Can internet-based sexual health services increase diagnoses of sexually transmitted infections compared to face-to-face services? Evaluation of an internet-based sexual health service in Lambeth and Southwark.**
REC reference:	**14/LO/1477**
Amendment number:	**8**
Amendment date:	**25 April 2016**
IRAS project ID:	**159386**

The above amendment was reviewed by the Sub-Committee in correspondence.

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Non-validated questionnaire [SIP esurvey]	1	05 May 2016
Non-validated questionnaire [SIP telephone survey]	1	26 April 2016
Notice of Substantial Amendment (non-CTIMP)	8	25 April 2016
Participant information sheet (PIS) [Survey]	3	26 April 2016
Research protocol or project proposal	10	25 April 2016

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

14/LO/1477:	**Please quote this number on all correspondence**

Yours sincerely

pp

Mr John Richardson
Chair

E-mail: nrescommittee.london-camberwellstgiles@nhs.net

Enclosures: *List of names and professions of members who took part in the review*

Copy to: *Dr. Zoe Harris, King's College Hospital NHS Foundation Trust*
The Research Office, Kings College Hospital NHS Foundation Trust

London - Camberwell St Giles Research Ethics Committee

Attendance at Sub-Committee of the REC meeting

Committee Members:

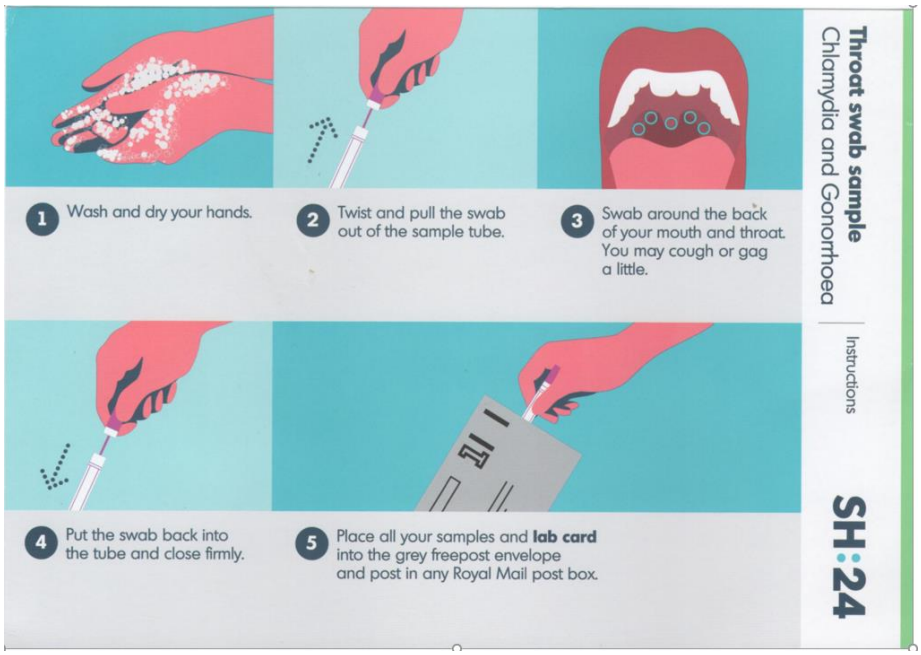
Name	*Profession*	*Present*	*Notes*
Mrs Jennifer Bostock	Philosopher of Psychiatry	Yes	
Mr John Richardson (Chair)	Retired Director of COREC: former Ecumenical Officer for Churches Together in South London	Yes	
Dr Mark Tanner	Consultant Psychiatrist	Yes	

Also in attendance:

Name	*Position (or reason for attending)*
Miss Aiki Sifostratoudaki	REC Manager

Appendix G: Examples of SH:24 pictorial leaflets with guidance on how to collect the specimens

Throat swab



Rectal swab

Blood Sample

What is included in the kit:
This is a simple and reliable test designed to be safely used at home.

Protective case

Sample tube


3 Lancets

2 Sterile wipes

2 Plasters

You will also need some tissue

How long does this test take?
It is best to do this when you have 5-10 minutes spare. Watching the video will help you take your sample more quickly whilst being warm and keeping your arm straight will really help blood flow to your finger.

When should I take this test?
You should wait 4 weeks after you think you could have been exposed to HIV and 12 weeks for Syphilis. This is because it takes time before STIs can be detected in a test. You can do this test at any time of day.

What will this test for?
We use your blood samples to test for Syphilis and/or HIV. Check your lab card to see which tests will be carried out using your samples.

Do I need to write my name on the samples?
No, we have already labelled your samples with a unique code - this is to ensure your experience is as easy and discreet as possible.

Can I request more lancets (used to prick your finger)?
Yes, text 'lancets' to 07860 041 233.

What happens next?
We will text you when your samples arrive at the lab.

We will then text you your test results as soon as possible (always within 7 days).

If you do have an infection we will advise you how to get treatment and further support.

Blood sample

Key information

SH:24

Watch this short tutorial video of someone doing the test:
bit.ly/bloodtestSH24

Contact us:
By text: 07860 041 233
By email: info.sh24@nhs.net

FAQs:
sh24.org.uk/faqs

1. Warm up to help your blood flow. Do the test after having a shower, bath, soaking your hand in warm water, exercising or holding a warm mug.

2. Remove the yellow lid from the tube. Close the protective case and gently push the tube into the corner of the case, so that it stands up, as shown above.

3. Twist and pull the tip off a lancet. Then use a wipe to sterilise your chosen finger.

4. To prick your finger, lay your hand on a flat surface. Press the lancet firmly into the middle of your fingertip.

5. Stand over the tube, keep your arm straight and massage down your finger (if your blood stops flowing, prick another finger). Fill to the top 600 line, then push the yellow cap down firmly (so it clicks).

6. Gently turn the tube upside down 5 times. Put the tube into the protective case. Place all your samples and **lab card** into the grey freepost envelope and post in any Royal Mail post box.

Blood sample

Instructions

SH:24

Appendix H: Publication of the findings from Chapter 5

OPEN ACCESS

ORIGINAL ARTICLE

Comparing the characteristics of users of an online service for STI self-sampling with clinic service users: a cross-sectional analysis

Sharmani Barnard,[1] Caroline Free,[2] Ioannis Bakolis,[3] Katy M E Turner,[4] Katharine J Looker,[5] Paula Baraitser[1]

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/sextrans-2017-053302).

[1]School of Population Health and Environmental Sciences, Centre for Global Health and Health Partnerships, King's College London, London, UK
[2]Faculty of Epidemiology, London School of Hygiene and Tropical Medicine, London, UK
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[5]Department of Population Health Sciences, Bristol Medical School, University of Bristol, Bristol, UK

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Received 6 June 2017
Revised 6 December 2017
Accepted 3 January 2018
Published Online First
7 February 2018

To cite: Barnard S, Free C, Bakolis I, *et al*. *Sex Transm Infect* 2018;**94**:377–383.

ABSTRACT

Objectives Online services for self-sampling at home could improve access to STI testing; however, little is known about those using this new modality of care. This study describes the characteristics of users of online services and compares them with users of clinic services.

Methods We conducted a cross-sectional analysis of routinely collected data on STI testing activity from online and clinic sexual health services in Lambeth and Southwark between 1January 2016 and 31March 2016. Activity was included for chlamydia, gonorrhoea, HIV and syphilis testing for residents of the boroughs aged 16 years and older. Logistic regression models were used to explore potential associations between type of service use with age group, gender, ethnic group, sexual orientation, positivity and Index of Multiple Deprivation (IMD) quintiles. We used the same methods to explore potential associations between return of complete samples for testing with age group, gender, ethnic group, sexual orientation and IMD quintiles among online users.

Results 6456 STI tests were carried out by residents in the boroughs. Of these, 3582 (55.5%) were performed using clinic services and 2874 (44.5%) using the online service. In multivariate analysis, online users were more likely than clinic users to be aged between 20 and 30 years, female, white British, homosexual or bisexual, test negative for chlamydia or gonorrhoea and live in less deprived areas. Of the individuals that ordered a kit from the online service, 72.5% returned sufficient samples. In multivariate analysis, returners were more likely than non-returners to be aged >20 years and white British.

Conclusion Nearly half (44.5%) of all basic STI testing was done online, although the characteristics of users of clinic and online services differed and positivity rates for those using the online service for testing were lower. Clinics remain an important point of access for some groups.

INTRODUCTION

STIs remain an important public health concern in the UK with increasing diagnoses of syphilis and gonorrhoea and high rates of late diagnosis of HIV.[1 2] Case identification and treatment is an effective form of preventing onward transmission, and strategies to improve access to diagnostic testing are a priority.[3 4] Online services for STI self-sampling at home harness almost ubiquitous access to the internet through mobile technologies among people of reproductive age and combine this with advances in diagnostics that enable self-sampling for STIs at home.[5 6]

Online services may address barriers to clinic use such as long waiting times, inconvenient opening hours, perceived stigma and travel time or cost.[7 8] A recent randomised controlled trial (RCT) demonstrated that when online services are promoted in the community alongside clinic services they increase uptake of STI testing across all population subgroups.[9] These services may be especially important to some higher-risk populations including young people, black and minority ethnic groups (BME) and men who have sex with men (MSM).[8 10–12] One UK study of an online HIV testing service described higher return rates among BME and MSM, suggesting that these services could improve access for these groups.[13]

Online services may also create new barriers to testing through user's concerns about the privacy of online service use, their ability to take the sample correctly and test accuracy.[10 12 14] Barriers of this sort may impact not only ordering of an online test but also on completion and returning of the test. One online service in the USA reported only 31% of self-sampling kits returned for testing.[15]

Little is known about who uses online services outside of research contexts. This exploratory, cross-sectional study compares the characteristics of those completing an STI test using an online service for STI self-sampling at home to those using clinic services in the two neighbouring south London boroughs of Lambeth and Southwark. Second, it compares the characteristics of those who ordered a test from online services and returned it to those who ordered a test and did not return a sample to identify potential barriers to online service use.

METHODS

Study setting

The London boroughs of Lambeth and Southwark are densely populated and ethnically diverse with high levels of deprivation.[16 17] In 2016, rates of STIs in these boroughs were some of the highest in the country.[18] New diagnoses of STIs (excluding chlamydia in under 25s) in Lambeth (3288/100 000) and Southwark (2799/100 000) were more than three times the national rate (795/100 000) and higher than the London regional rate (1547/100 000).[18]

Appendix I: Study Protocol for the Characteristics of users of online services for STI self-sampling at home.

DO USERS OF ONLINE SERVICES FOR STI SELF-SAMPLING AT HOME DIFFER FROM USERS OF CLINIC SERVICES? A CROSS-SECTIONAL ANALYSIS OF ROUTINELY COLLECTED DATA FROM SEXUAL HEALTH SERVICE USE IN SOUTH LONDON IN 2016

Protocol details

Version: 20170330

final

29.03.2017

List of Abbreviations

BME	Black and Minority Ethnic
DOB	Date of Birth
GUM	Genitourinary Medicine
GUMCAD	Genitourinary Medicine Clinical Activity Dataset
GSTT	Guy's and St Thomas' Trust
KCH	King's College Hospital
LSOA	Lower Super Output Area
MSM	Men who have Sex with Men
PHE	Public Health England
RCT	Randomised Controlled Trial
R&D	Research and Development
SHHAPT	Sexual Health and HIV Activity Property Type
STI	Sexually Transmitted Infection

Summary

Aim(s) and reason for the study

This study aims to describe the characteristics of users of online sexual health for STI self-sampling and compare them to users of clinic services for STI testing in the boroughs of Lambeth and Southwark where demand for services is high. It also aims to describe the characteristics of individuals that order a kit and return sampling kits for testing to those that do not.

Primary and secondary objectives

Primary Objective:

To describe the characteristics of users of online services and compare them to clinic users

Secondary Objectives:

To describe the proportion of testing that is done using online services

To describe the proportion of online sampling kits that are returned for testing

To describe the factors that influence return of sampling kit for testing

Brief description of methods

This cross-sectional study will use routinely collected data from all sexual health clinics and online services in boroughs of Lambeth and Southwark. It will examine STI testing activity among residents of the neighbouring boroughs within clinics and in online services. Sexual health service activity data from January 1, 2016 to March 31, 2016 will be obtained via electronic transfer. We will use non-parametric tests and logistic regression to describe the characteristics of online users and compare them to clinic users.

Background

Sexually transmitted infections (STIs) remain a major public health concern in the UK. Recent trends in STI diagnoses show increasing diagnoses of syphilis and gonorrhoea as well as a continuing high number of late diagnoses of HIV [9, 12]. Chlamydia also remains an important public health concern in the UK because although there has been a recent decline in the number of chlamydia diagnoses, this is attributed to a reduction in testing rather than a decline in incidence of the infection [9]. Because these STIs are infectious and often asymptomatic, rapid access to diagnostic testing is central to the prevention strategy to prevent onward transmission of infection [5, 33]

Case identification and treatment is the most effective form of prevention of STIs, therefore increasing access to diagnostic testing through innovations in sexual health service delivery is a priority for Public Health England (PHE) [31, 37, 40]. Online services for STI self-sampling are one recent innovation in sexual health service delivery. Online services harness the potential of high levels of access the internet and mobile technologies in amongst people of reproductive age and combine it with recent technological advances in diagnostic technologies that enable users to self-sample for STIs of major public health importance in out of clinic settings [69, 74, 347].

Online services for self-sampling at home have the potential to improve access to STI testing by addressing barriers to accessing sexual health services that could relate to both the characteristics of the service and the characteristics of the individual. By offering an additional point of contact for basic STI testing, online services could address service related barriers by increasing efficiencies within services through moving less complex cases online therefore freeing up clinic space for more complex cases and reducing waiting times [93]. By offering users convenient, private access to STI testing without the need to travel to a clinic, online services may overcome individual barriers to clinic access such as time constraints, perceived stigma and inability to travel to the clinic [94, 172, 348].

For online services to increase access to STI testing they need to be highly acceptable. Evidence from a recent randomised controlled trial (RCT) that compared uptake of testing between online (in addition to usual care) and clinic services in south London, suggests online STI testing, delivered alongside usual care increases uptake of STI testing (EMMA WILSON). Evidence from qualitative research investigating the acceptability of online services for STI testing amongst high risk groups including young people, black and other minority ethnic groups (BME) and men who have sex with men (MSM) indicates services are highly acceptable and these groups intend to use them [170, 172, 184, 185, 349]. However, there is evidence that online services may not be acceptable for some people. Qualitative studies from the UK, Europe and the USA suggest there are concerns about social privacy when using online services including privacy of one's mobile phone, especially for young people could be an issue [92, 170]. Additionally, there is evidence that concerns about self-efficacy to self-sample, test accuracy and the value of a health care provider in supporting the sampling procedure could be a barrier to access of online services [151, 177, 189, 349].

For online services for STI self-sampling at home to have the greatest public health impact they need to increase access to groups in whom the risk of infection and onward transmission is highest [36]. In the UK, this includes young people aged 16 and 24, in men who have sex with men (MSM), in black minority ethnic groups and in urban populations[9, 12]. Descriptive studies from the USA of online services for self-

sampling for bacterial STIs at home suggest online services can be successful in reaching groups with high levels of infection [90, 179, 350]. Little is known however, about who will access online services in the UK context where online services are part of routine service provision, access to STI testing in clinics is free and, whether online services will reach high risk groups.

This exploratory cross-sectional study aims to determine who accesses online services and whether those accessing services are from populations that are at high risk of infection in two boroughs of south London where online services are part of routine service provision, sexual health needs are high, and clinics are oversubscribed. It will describe service use for STI testing in the boroughs and the proportion of which is carried out through the online service. It will compare the characteristics of residents of the boroughs that order and return STI self-sampling kits from the online site to individuals that use clinic services. In sub analysis it will describe the characteristics of those that ordered a self-sampling kit from online services and compare the characteristics of those that completed the self-sampling process and returned the kit to the laboratory to those that did not.

AIMS

The aim of this cross-sectional study is to describe the characteristics of users of online sexual health for STI self-sampling and compare them to users of clinic services for STI testing. We also aim to describe the characteristics of individuals that order a kit and return sampling kits for testing to those that do not.

Primary objectives

To describe the characteristics of users of online services and compare them to clinic users

Secondary objectives

To describe the proportion of STI testing that is carried out online

To describe the proportion of online sampling kits that are returned for testing

To describe the factors that influence return of sampling kit for testing

Study Design

This exploratory cross-sectional study will involve the analysis of three months of routinely collected individual level service sexual health service activity data from providers in Lambeth and Southwark. It will examine STI testing activity among residents of the neighbouring boroughs within clinics and in online services. Sexual health service activity data from January 1, 2016 to March 31, 2016 will be obtained via electronic transfer.

Study population

Data will include STI testing activity in any service channel for residents of Lambeth and Southwark. This includes all GUM and community clinics within Guy's and St Thomas' Trust (GSTT) and King's College Hospital Trust (KCH) as well as the online service. Attendances coded with Sexual Health & HIV Activity Property Type Codes (SHHAPT) codes for chlamydia, gonorrhoea, syphilis and HIV tests or diagnoses will be included for any attendance between January 1st, 2016 and March 31st, 2016 from GUM, community or and online sexual health services in Lambeth and Southwark. Based on service data from Q1 2015, we expect the number of tests carried out in the boroughs during this time to be in excess of 5000. Because the online service is not available to people who do not live in Lambeth or Southwark and people under the age of 16, and the clinic services are not available to prisoners we have restricted the data to include only residents of Lambeth and Southwark, users aged 16 years and over and excluded prisoners.

To ensure the population is comparable between clinic services and online services will include only clinic attendances that could have been done online. This will include any service activity where SHHAPT codes for any STI test for HIV, syphilis, chlamydia or gonorrhoea or a combination of the four tests (P1A, T1, T2, T4, T3, T7, TT) or diagnosis (A1, A2, A3, A5, A6, B (O,R), C4 (O,R), H, H1, H1B, H1A)[222]. Because, in clinics STI testing codes are often accompanied by coding for advice, health promotion or partner notification, we will include any testing or diagnostic activity which included these codes (D3, PN, PNC, PNG, PNS, P1B, P1C, P3, SW, SRH, T9). We will exclude any service use with any other service activity including coding for any other STI testing (T5, T6, T7, T10, TS). The coding algorithm was developed with input from external local clinicians and academics.

For online service data, coding for STI testing is assigned on receipt of a sampling kit by the laboratory, therefore activity will only be included if kits are returned to the laboratory. Data will be excluded for samples which are insufficient and therefore cannot be tested and for kits returned more than six weeks after the order date.

Inclusion Criteria

All residents of the boroughs attending sexual and reproductive clinics for basic STI testing

All residents of the boroughs requesting sexual health screens online

All residents of the boroughs attending genitourinary medicine (GUM) clinics for basic STI testing

Residents aged 16 or over only will be included

Exclusion criteria

Residents aged <16

Non-residents of the boroughs

All patients attending sexual health or GUM clinics for services that do not include STI testing

All patients attending sexual health or GUM clinics STI testing and additional services which could not be done online

Data

Data to be collected

All data will be provided from automatic downloads of clinic workload routinely collected to Jonathan Syred (Employed within Kings). All data will be anonymised, and patient identifiable data removed. The format of data collected will be that used by Pathway Analytics. Datasets will then be provided to Sharmani Barnard, under a research passport who will be responsible for the generation of code to analyse the dataset. All data is collected routinely by clinics to provide monitoring to public health England (GUMCAD dataset). Missing data will be excluded from the analysis.

Data Items

Variable	Variable type	Variable form	Description
Age (years)	Exposure	Numerical	Reported as date of birth (DOB) by patient and converted to years during anonymization
Gender	Exposure	Binary	Male/Female. Self-reported data
Sexual orientation	Exposure	Categorical	Heterosexual/ Gay/Lesbian/ Bi-sexual/ Not Known. Self-reported data
Country of Birth	Exposure	Categorical	This is the country where the patient was born. Refer to the ISO 3166-1 standard codes. Available at: http://www.iso.org/iso/home.htm. Self-reported data
Ethnicity	Exposure	Categorical	Self-reported as per the classification used for the 2001 census: White: British/Irish/ Any other White background Mixed: White and Black Caribbean/ White and Black African/ White and Asian / Any other mixed background Asian or Asian British: Indian/ Pakistani/ Bangladeshi/ Any other Asian background Black or Black British: Caribbean /African/ Any other Black background Other Ethnic Groups: Chinese/ Any
Index of multiple deprivation	Exposure	Categorical/ discrete	Measure of multiple deprivation at small area level Geographical units- Lower Layer Super Output Areas (LSOAs) Generated from postcode data reported by patients.
Type of service use	Outcome	Binary	Generated from clinic identification code and dataset of origin. Categorized in to clinic or online.
Kit return	Outcome (sub-analysis)	Binary	Generated from laboratory receipt date within the online database. Samples received within 6 weeks of ordering and

Data handling and record keeping

All electronic files will be stored securely on password protected computers at King's College London and backed up on encrypted removable storage devices stored in a lockable cabinet. Only the study team will have access to the data. Data will be stored for five years then destroyed. No personally identifiable details will be collected with the survey data.

Statistical Considerations

STUDY SIZE

We will study all records of attendances at sexual health services (online and clinic) in Lambeth and Southwark over 3 months of the study, starting January 1, 2016. In the first quarter of 2015, the total number of basic STI tests taken in the boroughs was 6,980, of which, 3,899 were taken by residents of the boroughs. We expect this figure to increase with the introduction of the online service. We therefore anticipate collecting records on an estimated 5,000 basic STI tests in Lambeth and Southwark in the first quarter of 2016. This size of population exceeds requirements for exploratory investigation.

ANALYSIS

We will describe the characteristics of online users and clinic users by presenting means and proportions of exposure variables. Non-parametric tests will be used to explore associations between exposure variables; age group, gender, ethnic group, sexual orientation and IMD quintile and the outcome variable type of service provider. We will then use logistic regression models to examine the strength of these associations. To avoid an excess number of variables and unstable estimates in our models, only variables with a p-value of <0·1 will be retained [351]. Finally, interaction between co-variates will be explored using two-way full factorial interaction terms within regression models and likelihood ratio tests. Subgroup analysis will be conducted using non-parametric tests to explore associations between exposure variables; age group, gender, ethnic group, sexual orientation and IMD quintile and the outcome variable for return of sample. We will then use logistic regression models to examine the strength of these associations. All analyses will be conducted with the use of STATA14·1 (Stata Corporation, College Station, Texas, USA). The analysis will be carried out by Sharmani Barnard at King's College London in Q3 and Q4 of 2016.

Ethical Considerations

Ethical approval

We are seeking R&D approval from Kings College Hospital NHS Foundation Trust (lead site) and Guy's and St. Thomas' NHS Foundation Trust. We are also applying for NHS ethics approval.

Informed consent

Because the study analyses anonymised routinely collected data informed consent is not required.

Reporting and Dissemination

The research findings will be shared with the SH:24 design team. Findings will also be shared publically through publication in order to inform future service design for STI self-sampling services.

Appendix J: STROBE checklist for observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
In title		
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Thesis background		
Objectives	3	State specific objectives, including any prespecified hypotheses
AIMS described, no hypothesis		
Methods		
Study design	4	Present key elements of study design early in the paper
In introduction		
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
5.1.1 longer description in Chapter 4		
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
5.1.2 and 5.1.3		

	Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
	5.1.4		
	Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
	5.1.4 5.1.5		
	Bias	9	Describe any efforts to address potential sources of bias
	Confounding described		
	Study size	10	Explain how the study size was arrived at
	In text		
	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
	Outcomes		
	Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
			(*b*) Describe any methods used to examine subgroups and interactions
			(*c*) Explain how missing data were addressed
			(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
			(*e*) Describe any sensitivity analyses
	5.1.6		
	Results		
Participants	13*		(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
			(b) Give reasons for non-participation at each stage
			(c) Consider use of a flow diagram done figure 5.1
Descriptive data	14*		(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders 5.1.7

		(b) Indicate number of participants with missing data for each variable of interest reported in tables
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures 5.1.7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included done
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses done
Discussion		
Key results	18	Summarise key results with reference to study objectives done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence done
Generalisability	21	Discuss the generalisability (external validity) of the study results done
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based wider PhD

Appendix K SHHAPT Codes and Notes

A. List of SHHAPT codes and related notes

SHHAPT Code	Description	Notes
A1	Primary syphilis	
A2	Secondary syphilis	
A3	Early latent syphilis	
A4	Cardiovascular syphilis	
A5	Neurosyphilis	
A6	All other late and latent syphilis	
A7A	Congenital syphilis	No age restriction
B	Gonorrhoea	Uncomplicated and complicated
C1	Chancroid	
C2	Lymphogranuloma venereum	
C3	Donovanosis	
C4	Chlamydial infection	Uncomplicated and complicated
C4N	Non-specific genital infection (NSGI)	Uncomplicated and complicated
C5A	Pelvic inflammatory disease / epididymitis	Any case of pelvic inflammatory disease or epididymitis.
C5B	Ophthalmia neonatorum	Any case of ophthalmia neonatorum.
C6A	Trichomoniasis	
C6B	Anaerobic/ Bacterial vaginosis and anaerobic balanitis	
C6C	Other vaginosis / vaginitis / balanitis	
C7	Anogenital candidosis	
C8	Scabies	
C9	Pediculosis pubis	
C10A	Anogenital Herpes simplex: first episode	
C10B	Anogenital Herpes simplex: recurrence	
C11A	Anogenital warts infection: first episode	
C11D	Anogenital warts infection: recurrence	All recurrent episodes of anogenital warts.

SHHAPT Code	Description	Notes
C12	Molluscum contagiosum	
C13	Viral hepatitis B (HbsAg positive): First diagnosis	
C14	Viral hepatitis C: First diagnosis	
C15	Viral hepatitis A: acute infection	
D2A	Urinary tract infection	
D2B	Other conditions requiring treatment at GUM clinic	
H	HIV positive	Known HIV positive patient not attending for HIV care
H1	New HIV diagnosis	
H1A	New HIV diagnosis: Acute	
H1B	New HIV diagnosis: Late	New HIV diagnoses with clinical AIDS diagnosis.
H2	Attendance for HIV-related care	All attendances relating to HIV care.
P4A	Cervical cytology: minor abnormality	
P4B	Cervical cytology: major abnormality	
T1	Chlamydia test	Chlamydia test only.
T2	Chlamydia and gonorrhoea tests	Chlamydia & gonorrhoea testing only.
T3	Chlamydia, gonorrhoea and syphilis tests	Chlamydia, gonorrhoea and syphilis testing only.
T4	Full sexual health screen including HIV antibody test	Chlamydia, gonorrhoea, syphilis and HIV testing.
P1A	HIV antibody test	
P1B	HIV antibody test offered and refused	
P1C	HIV test inappropriate	All patients where an HIV test was not appropriate
P2A	Hepatitis B vaccination: 1st dose	
P2B	Hepatitis B vaccination: 2nd dose	
P2C	Hepatitis B vaccination: 3rd dose	

SHHAPT Code	Description	Notes
P2I	Hepatitis B immune	All patients who are ineligible for hepatitis B vaccination because they are already immune.
P4	Cervical cytology done	All patients who had cervical cytology done, regardless of outcome.
W1	HPV vaccination: 1st dose	
W2	HPV vaccination: 2nd dose	
W3	HPV vaccination: 3rd dose	
PN	Partner notification initiated	Level 2 services only: Partner notification has been initiated for this patient by this clinic.
PNC	Partner notification- related attendance: Chlamydia	Presenting as a partner of an index case diagnosed with chlamydia.
PNG	Partner notification- related attendance: Gonorrhoea	Presenting as a partner of an index case diagnosed with gonorrhoea.
PNS	Partner notification- related attendance: Syphilis	Presenting as a partner of an index case diagnosed with syphilis.
PNH	Partner notification- related attendance: HIV	Presenting as a partner of an index case diagnosed with HIV.
PEPS	Post exposure prophylaxis after sexual exposure (PEPSE)	New code to record patients given HIV prophylaxis following sexual exposure
P3	Contraception (excluding condom provision)	
D3	Other episodes not requiring treatment	
Z	Prisoner	Provision of a service to a patient known to be a current prisoner.
SW	Sex worker	Provision of a service to a patient known to be a current sex worker.

B. The following suffix codes can only be used with a parent SHHAPT code:

SHHAPT Code Suffixes	Description	SHHAPT codes to be used with
R	Rectal infection	B, C4, C2, C4N
O	Pharyngeal infection	B, C4, C2

X	Diagnosed previously elsewhere	B, C4, H1, H1A, H1B
M	Medication given	B, C4, C10A, C10B, C11A, C11D.
Q	Quadrivalent HPV vaccine	W1, W2, W3

C. Permissible permutations of SHHAPT codes and their suffixes

SHHAPT Code & Suffix Combinations	Description		Service type*
BR	Gonorrhoea	Rectal infection	L2,L3
BO		Pharyngeal infection	L2,L3
BX		Diagnosed previously elsewhere	L2,L3
BM		Medication given	L2
BRX		Rectal infection, Diagnosed previously elsewhere	L2,L3
BRM		Rectal infection, Medication given	L2
BOX		Pharyngeal infection, Diagnosed previously elsewhere	L2,L3
BOM		Pharyngeal infection, Medication given	L2
C4R	Chlamydia	Rectal infection	L2,L3
C4O		Pharyngeal infection	L2,L3
C4X		Diagnosed previously elsewhere	L2,L3
C4M		Medication given	L2
C4RX		Rectal infection, Diagnosed previously elsewhere	L2,L3
C4RM		Rectal infection, Medication given	L2
C4OX		Pharyngeal infection, Diagnosed previously elsewhere	L2,L3
C4OM		Pharyngeal infection, Medication given	L2
C2R	LGV	Rectal infection	L2,L3
C2O		Pharyngeal infection	L2,L3
C4NR	NSGI	Proctitis	L2,L3
H1X	HIV	Diagnosed previously elsewhere	L3
H1AX			L3
H1BX			L3
C10AM	Herpes	Medication given	L2
C10BM			L2
C11AM	Warts	Medication given	L2
C11DM			L2
W1Q	HPV vaccine	Quadrivalent vaccine	L2,L3
W2Q			L2,L3
W3Q			L2,L3

*L2 = Commissioned Level 2 Sexual Health Services (Non-GUM); L3 = Specialist Sexual Health and HIV Services (GUM)

Appendix L: Participant Information Sheet (Qualitative Interviews)

Version 2 August 11 2015

King's College Hospital NHS
NHS Foundation Trust

Guy's and St Thomas' NHS
NHS Foundation Trust

KING'S College LONDON

Participant Information Sheet

We are inviting you to take part in a research study. Before you decide, it is important that you know why we are doing the study and what is involved. Please read the following information carefully.

What is the purpose of the study?
This study is exploring what influences peoples use of online services for sexual health and whether they think they need an STI test. We will use the information we gain from the interviews to design a survey which we will ask everyone who was allocated to the intervention arm in the 'gettested' study to do.

Why have I been chosen?
You have been chosen because you were allocated to the intervention arm of the 'gettested' study and you ticked a box that said you were happy to be contacted for further research.

Do I have to take part?
No, it is up to you to decide whether you would like to take part.

What will happen if I take part?
You will be asked questions about what you thought of the online service. The study co-ordinator will ask you these questions but you are free to discuss what you like about the service. We will record the interview on an audio file but we will make sure no one could know it was you. The file will be kept confidentially.

Will you compensate me for the time this takes?
We will give you £20 once you have finished the interview.

What are the alternatives?
You do not have to take part.

What are the possible disadvantages in taking part?
Completing the interviews will take up some of your time.

You may find talking about STI testing stressful. If you do, you can stop the interview at any time.

What are the possible benefits of taking part?
Taking part in this study will help us understand how to help people get the sexual health services they need.

You may find talking about what you liked and didn't like about the service useful, particularly if you're thinking about using a similar service again.

PIS Interview

Appendix M: Participant Consent Form (Qualitative Interviews)

Version 2 August 11 2015

King's College Hospital NHS
NHS Foundation Trust

Guy's and St Thomas' NHS
NHS Foundation Trust

KING'S College LONDON

Study Number:

Patient Identification Number for this study:

CONSENT FORM

Title of Project: Exploring the use of online services for self-testing for sexually transmitted diseases at home

Principal Investigator: Dr Paula Baraitser

Please read the following statements carefully and tick all boxes

1. I confirm that I have read and understand the information sheet [version X, 2014] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary (my choice) and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that all information I provide will remain confidential in accordance with the Data Protection Act of 1998 and will only be used for the purposes of the study. Only the research team directly involved with the study will have access to this information. ☐
4. I agree to take part in the above study. ☐

Name of participant	Signature	Date
Name of person taking consent	Signature	Date

If you need more information to help you decide, please contact:

Sharmani Barnard (Study Coordinator)
Department of Global Health
King's College London
Weston Education Centre
Denmark Hill
E5 9RJ

Email: sharmani.barnard@kcl.ac.uk
Tel: 0207 848 5052

Consent Interviews

Appendix N: Interview topic guide

First of all, I would like to thank you very much for your willingness to take part in this interview. First let me explain what this study is about. I am a researcher from King's College London, and I am studying the use of STI self-sampling test kits. The aim of this study is to explore why people do or don't choose to order STI self-test kits online and why they do or don't return the test kits. The ultimate goal of the study is to develop more support for users who order self-testing kits online. To achieve this, we need help from people like you, which is why we are here today.
Earlier this year you took part in a randomised controlled trial for STI testing and you were allocated to the group of people that were asked to use a website to see if they wanted to order and STI test.
I would like to talk with you about your experience using the site. I will focus on your opinion

I'm really interested in your opinion so there are no correct or incorrect answers. What you say in the is interview will be treated confidentially. With your permission I will tape the interview and process the tape anonymously so no one could trace it back to you.
The interview will take no longer than 30 minutes.

Before we get started, do you have any questions?

Interview questions

You were allocated to the online arm of the study. State what the person did here.

EXPERIENCES, EXPECTATIONS AND BELIEFS

First of all, I'd like to know about your experience of ordering products online. How do you feel about ordering things over the internet in general?

What sort of things do you usually order online?

Have you had any particularly good or bad experiences?

What about health-related products? (prompt if required only - health care tests? Health care treatments? What about health advice?)

Now thinking about the study, you took part in can you take me through the process of being invited to the study, how it happened, what you thought and what you did next? (Prompt if necessary, only; what about ordering the kit online, what about doing the test at home?)

Do you know anyone else who has ordered a test like this before?

How did they find it?

Can you tell me about a time you or anyone you know has used another online health services? (What happened?)

Can you tell me about some of the places that you might go for STI testing? (prompt; what is it like? What happens when you go there?)

Can you think of any reasons why people might **not want to** use an online service for STI testing?

Can you think of any advantages or disadvantages to ordering a test online and taking the sample at home?

Can you think of any reasons why people would not **be able to** use online services for STI testing?

Can you give me any examples?

Think about sexual health- is it an important part of someone's health and wellbeing?

Is this something you talk to your peers about?

Is this raised often at school?

How important is it for someone to have contact with a health professional when they are worried about their sexual health?

Thinking through sexual health- what do you think about people manging their sexual health using online services?

Tell me about whether you think it is different from people going to a clinic?

ACCEPTABILITY, USER FRIENDLINESS, INTERPRETATION AND RELIABILITY

INTERVIEWER TO SHOW THE WEBSITE ON A DEVICE

Tell me what you thought of the website you were asked to use (HAND THE DEVICE TO THE PARTICIPANT AND SHOW THEM THE WEBSITE)

How do you think people will feel about the information that is available on the site?

What about the order form?

What did you think of the information that people are asked to provide?

How did you feel about navigating around the website to find information?

How do you feel about being able to order a STI test online?

Can you think of any advantages to ordering online?

Can you think of any disadvantages to ordering online?

How do you think people feel about having a test kit mailed to their house?

Can you think of any advantages to having the kit mailed to you?

Can you think of any disadvantages to having the kit mailed to you?

How do you think people feel about doing the test on their own?

Can you think of any advantages or disadvantages?

How do you think people feel about receiving the results of the test via text message?

Can you think of any advantages of receiving the results via text?

Can you think of any disadvantages of receiving the results via text?

How do you think people feel about the length of time it takes receive their results?

How do you think people feel about the reliability of the results of a self-test?

Do you think the results of a self-test could differ from those that you would do with a doctor or nurse?

How do you think people will feel about going to the clinic to get treatment for positive results?

SHOW THE PARTICIPANT AN EXAMPLE OF THE TEST KITS THEY MAY OR MAY HAVE NOT RECEIVED.

What did/do you think about the packaging the test kits come in?

Did you open the package??

Can you tell me how you felt about doing the tests?

Do you think there are things that could have been changed about the test?

What did you think about (state each test)?

Did they look like they could be done at home?

Tell me about any ways you tried to get more information about how to do the tests.

Did you go Online/friend/family/leaflets/doctor?

Tell me about how it helped

Do you think you would order a self-test again?
Why/why not?

FOLLOW UP

Going back to thinking about receiving the results by text.
What do you think you would do if your results were positive and you received a text?
Would it matter where you were when you received your text?
What sort of information would you want to receive with your result?
How would you want to receive your treatment?
Do you think talking to someone would help?

INFORMATION

Thinking back to the website- can you tell me more about the information you used to make a decision about ordering a test?
Tell me about any information you saw about how to do the test?
Tell me about any information you saw about how the test would be delivered
Tell me about any information you saw about how you would receive the results
Tell me about any information you saw about how you would get treatment

Is there any information that you could have been given that would have changed your mind about ordering the test?

Is there anything else you want to say about the information provided by the service?

NEED

I'm going to run through some scenarios- imagine your friend has come to you for advice. Tell me what you would say if your friend:
Told you that they were starting a relationship with someone new and wanted them to get tested before they started having sex.
Told you that they had unprotected sex with someone who they don't know
Told you that they had had unprotected sex with someone who they thought had Chlamydia
Told you that they had had unprotected sex with someone who they thought had HIV
Told you that they had symptoms of an STI but weren't sure what to do
Told you that they had slept with more than 10 people in the past year but always used protection

FINAL

In an ideal world, how do you think that STI testing should available to people?
What is important?
Is there anything that you could think of that could have changed your mind about whether you ordered a test?

Do you have anything else to say about STI testing or online services for STI testing?

I'd like to thank you very much for this interview. I'd like to emphasize once more that what you told me will be treated in the strictest confidence. If you have any further questions or comments, please don't hesitate to contact me. Do you have any questions now? Are there any things that we haven't discussed that you think are important?

If I have any further questions about what we have spoken about today, would you mind if I phoned you to clarify?

Once again, thank you very much for your time.

Appendix O: Expert Panel Members and Methodological experts

Dr Paula Baraitser

Paula Baraitser is a consultant in sexual health at King's College Hospital, a Senior Lecturer in Global Health at King's College London, a director of the community interest company, SH:24 (www.sh.24.org.uk) and a Health Foundation Improvement Science Fellow. Her research focuses on the innovation and evaluation of sexual health services, particularly online sexual health services in the UK and abroad. Paula is a trustee of the Faculty of Sexual and Reproductive Health Care (FSRH), chairs the International Affairs Committee of the FSRH and is a member of the sexually transmitted infections committee of the European Society of Contraception. She leads the 'Global Health in Local Practice' module within the MSc/iBSc in Global Health.

Professor Caroline Free

Dr Caroline Free is a Professor of Primary Care and Epidemiology at the London School of Hygiene and Tropical Medicine (LSHTM), a General Practitioner and Honorary Consultant in Sexual and Reproductive Health at Kings College Hospital. She obtained her medical degree from Leeds University, an MSc from LSHTM and PhD, focussing on contraception use, from the University of London. She worked as a clinician in rural India and continues to work in south-east London providing primary, sexual and reproductive health care to an ethnically and socio-economically mixed area of London.

Dr Ioannis Bakolis

Ioannis has extensive experience in biostatistics, epidemiology and population research and has led the design analysis of various large UK and international studies in the fields of environmental epidemiology, public health and policy evaluation. His methodological work involves exploring quasi experimental designs for evaluating population health interventions with the use of observational data (Regression Discontinuity design and Bayesian Difference in Differences) as well as modelling techniques for valid causal inference.

Methodological Expert

Dr Silia Vitoratou

Silia is a Lecturer in Psychometrics and Measurement and leads the Psychometrics and Measurement Lab (PML). Silia holds a BS degree in Mathematics, a Msc degree in Biostatistics (thesis in applied psychometrics) and a PhD in Bayesian model comparison for IRT models.

Appendix P: Items from existing scales

Survey Item pool taken from existing scales		
Theme	**Domain/element**	**Potential Items for inclusion**
Trust in clinic sexual health services	General	You should be cautious when dealing with health care organizations. Patients have sometimes been deceived or misled by health care organizations. Health care organizations have sometimes done harmful experiments on patients without their knowledge. Sometimes I wonder if health care organizations really know what they are doing. I always trust what the doctor tells me[352]
	Information	I always trust what the doctor tells me[352]
		Would you trust health information from the local health department in your community?[252]
		Would you trust health information from the NHS?[252]
	Data security	Health care organizations don't always keep your information totally private.[352]
	Accuracy of the test results	Mistakes are common in health care organizations[352]
		When health care organizations make mistakes they usually cover it up.[352]
		The result of this test is reliable[151]
		If the test result is normal (nothing is the matter), you can be sure that the result is correct[151]
		If the test result is abnormal (something's the matter), you can be sure that this result is correct[151]
		If the test result indicates that something's the matter, I know what I should do next [151]
Trust in online sexual health services	Information	Would you trust health information from the local health department in your community?[252]
		Would you trust health information from the NHS?[252]
		Would you trust health information from a website?[252]
	Data security	Online organizations don't always keep your information totally private.[352]
	Accuracy of the test	The result of this test is reliable[151]
		If the test result is normal (nothing is the matter), you can be sure that the result is correct[151]
		If the test result is abnormal (something's the matter), you can be sure that this result is correct[151]
		If the test result indicates that something's the matter, I know what I should do next[151]
	Postal service	
	Discrete package delivery	
Subjective norms around testing online	Users identity and influence of peers	Many people like me would [do behaviour][150]
		Using online STI testing will support critical aspects of my heath care.[353]

General health confidence	Manage own health	Using online STI testing will enhance my effectiveness in managing my health care.[353]
		I know enough about my health I can look after my health I can get the right help if I need it I am involved in decisions about[284]
	Find help if needed	
	Make decisions about own health	
Self-efficacy to self-sample	General	I feel confident that I can perform a STI self-test effectively I am confident that I could do an STI self-test using an online service I am confident in my ability to interpret how to do the test I am confident that I know the correct procedures for conducting STI self-tests I feel well informed about how to perform STI self-tests[286]
		It would be easy to [do behaviour][150]
		I am confident that I could [do behaviour][150]
	Carry out blood test	
	Ease of use	My interaction with online STI testing will be clear and understandable.[353]
	Reading and interpreting instructions	How often do you have someone help you read hospital materials?[354]
	Getting the correct result	If I did a [behaviour], the results would be accurate[150]
Professional support	Validity of results	
	Reduced responsibility	
	Reassurance	
	Promotion of sexual health	
	Specific advice	
Privacy	Feelings about stigma	If you had an STI People would avoid you. People would think you were unclean. Other people would think badly of you? Other people would not want to be friends with you? Other people would be disgusted by you? Other people would be uncomfortable around you?[283]
	Feelings about shame	**If you had an STI** How ashamed would you feel? How embarrassed would you feel? How guilty would you feel? How scared would you feel? How disappointed in yourself would you feel?[283]

	Perceived judgement from health care providers	**If you told a doctor or HCP that:** You had sexual intercourse; how likely do you think that he/she would think less of you? You had oral sex; how likely do you think that he/she would think less of you? Had anal sex, how likely do you think that he/she would think less of you? Had sex with lots of different people, how likely do you think that he/she would think less of you?[283]
Feelings about convenience when testing	Time spent testing	
	Timing of test	
	Urgency to test	
	Accessing additional services	
	Ease of test	
	Convenience of attending a clinic	
	Convenience of receiving a package containing an STI testing kit in the post	
Perceived risk	Perceived risk of infection	
	Perceived infection at risk of	

Appendix Q: Pool of Newly Developed Survey Items

Survey Item pool –Newly developed items		
Theme	**Domain/element**	**Potential Items**
Trust in clinic sexual health services	General	
	Information	I trust that the information that I receive at a clinic is accurate and up to date
	Data security	Any information about me is stored safely at the clinic
	Accuracy of the test results	I trust the results are accurate from an STI test that is done in a clinic
		I trust that the test kits they use at the clinic are accurate
Trust in online sexual health services	Information	
	Data security	Any personal information that I would enter into the website would be stored safely
		I would trust that my data would be stored safely
	Accuracy of the test	I would trust the result from the test kit that is sent to me is accurate
		If the test result was positive (that I had something), I would trust it
		If the test result was negative (that I didn't have an infection), I would trust it
		The test kit they would send is as accurate as the ones they use in the clinic
	Postal service	The idea of sending my biological samples in the post worries me
		The idea of sending my blood in the post worries me
		If I did an STI test at home I wouldn't trust the postal system to deliver my samples safely.
		I would trust the postal system to deliver my samples back to the lab safely
	Discrete package delivery	I would trust that the packaging that the test kit is sent in is discrete (private)
		The kit would come in an opaque envelope
		I would trust that the envelope they sent the kit in wouldn't have any markings on it
		The service wouldn't send something that said 'STI test' on it
Subjective norms around testing online	Users identity and influence of peers	My sexual partners expect me to have STI tests.
		I am keen to try new health services when they become available
		Many people like me take responsibility for our own health
		People like me would use online services for STI testing
		Many people like me would test at home for STIs
		People like me like using new health services
		Many people like me get tested for STIs regularly
		Most people who are important to me get tested for STIs regularly
		The people in my life whose opinions I value get tested for STIs
		Many people like me would use online services for STI testing
	Manage own health	Overall, online STI testing will be useful in managing my health care

General health confidence	Find help if needed	If the test result indicates that something's the matter, I know what I should do next
		If I got stuck, I could find out where to get help
	Make decisions about own health	Taking responsibility for my own health is something I like to do
		I like to be in control of my own health
	General	
Self-efficacy to self-sample	Carry out blood test	The thought of seeing blood scares me
		Just thinking about pricking my finger makes me feel anxious
		If doing the test meant that I would have to prick my finger, I would be able to do it
	Ease of use	Online STI testing will be easy to use.
		Home STI testing kits are easy to use
		I will find it easy to get the self-test to do what I want it to do
		It would be easy to do a STI self-test using an online service
		I would be able to do the test at home as well as I could do it in the clinic
	Reading and interpreting instructions	I would be able to do the test at home as well as I could do it in the clinic
	Getting the correct result	I am confident that I could do an STI self-test using an online service
		The result of this test is reliable
		If the test result indicates that something's the matter, I know what I should do next
	Validity of results	Doing a test with the healthcare provider means the results will be correct
		Having a health care provider present means I'm more likely to trust the results of the test
		Health care providers help me to get it right
		It helps to have a doctor or nurse around when you're taking samples for an STI test
		It doesn't feel right to do an STI test without a doctor or nurse to help you
Professional support	Reduced responsibility	When I have a STI test it's important that I see at health care provider to make me feel less nervous
		It helps to have a doctor or nurse around when you're taking samples for an STI test
		It doesn't feel right to do an STI test without a doctor or nurse to help you
	Reassurance	It's really important to me that I get reassurance from an HCP quickly
		The reassurance I get from the health care provider in the clinic is important to me
		It's important that I see a doctor or nurse
		It helps to have a doctor or nurse around when you're taking the samples for an STI test
		It doesn't feel right to do an STI test without a doctor or nurse to help you
	Promotion of sexual health	I like that doctors and nurses in clinics encourage me to have safe sex
		It's important to get information about safe sex when you test at a clinic
		Doctors and nurses give me advice on safe sex which helps me to manage my health

	Specific advice	The personalised information I get from the health care provider in the clinic is important to me
		When I have a STI test it's important that I see a health care provider so that I can get personalized information
		I like that doctors and nurses are able to give me advice that is specifically for me
Privacy	Stigma	I would feel dirty if a doctor examined me for sexually transmitted diseases
		People with sexually transmitted disease have been hanging with the wrong crowd
		Getting examined for a sexually transmitted disease makes people think I have poor morals
		Most people I know think that a sexually transmitted disease is a sign of a weak character
		Getting a sexually transmitted disease means I have poor morals
		Getting a sexually transmitted disease means a person is dirty
		I don't want the people I live with to find out if I did an STI test
		I would rather that the people I lived wouldn't find out if I did an STI test
	Shame	I would be worry about my friends or family seeing me if I went to a sexual health clinic
		Getting a sexually transmitted disease would make me feel lonely
		I would worry that my sexual partner would find out that I had done an STI test
		Getting a sexually transmitted disease means I don't keep myself clean
		Getting examined for a sexually transmitted disease means I'm not clean
		Getting a sexually transmitted disease means I don't take care of myself
		People with sexually transmitted diseases should be ashamed of themselves
		I would feel embarrassed about walking into a clinic
	Judgement	I would worry about what the staff thought of me if I went to a sexual health clinic
Convenience	Time spent testing	It's important that I don't have to wait in a waiting room for long
		When I think about where I am going to get an STI test the most important thing is how long I will have to wait for a test
	Timing of test	It's really important to me that I can access STI testing services outside of office hours
		When I think about where I am going to get an STI test the most important thing is whether I can access a test outside of office hours
		It's important that I can take a test as soon as possible
		It's important that I can take a test at a time that suits me
	Urgency to test	It's important to me that I get results quickly

		When I think about where I am going to get an STI test the most important thing is how quickly I can get the results
		It's important that I can take a test as soon as possible
		It's important that I don't have to wait for an appointment to test
	Accessing additional services	When I got to get a sexual health check it's important to me that I can also get other services such as contraception or counselling
		It's important that I can get other services such as contraception, advice or to see your GP
		It's important that I see a doctor or nurse
	Ease of test	It's important that the test is easy
	Convenience of attending a clinic	At the time of testing rate how difficult it was for you to attend a clinic
		What best describes your hours of work or study?
	Convenience of receiving a package containing an STI testing kit in the post	At the time of testing, rate how difficult it was for you to receive a package containing an STI kit in the post
		Which best describes the people who you live with
		What best describes your hours of work or study?
Perceived risk	Perceived risk of infection	My chances of getting an STI are great.
		My sexual health behaviour makes it more likely that I will get an STI
		I feel that my chances of getting and STI in the future are good
		There is a good possibility that I will get an STI
	Perceived severity of infection	I think I have ____
		I think I am at risk of _____
		For each of the following infections rate how likely you are to be infected on a scale of 1-10
		The infection I am at risk of having is _____
		I was tested because I thought I had_____
		At the time of testing, which infection did you think you were most at risk of? (multiple answers)
		Did you think the harmfulness of the infection you might have had was (not harmful to very harmful)

Appendix R: Feedback from Pilot

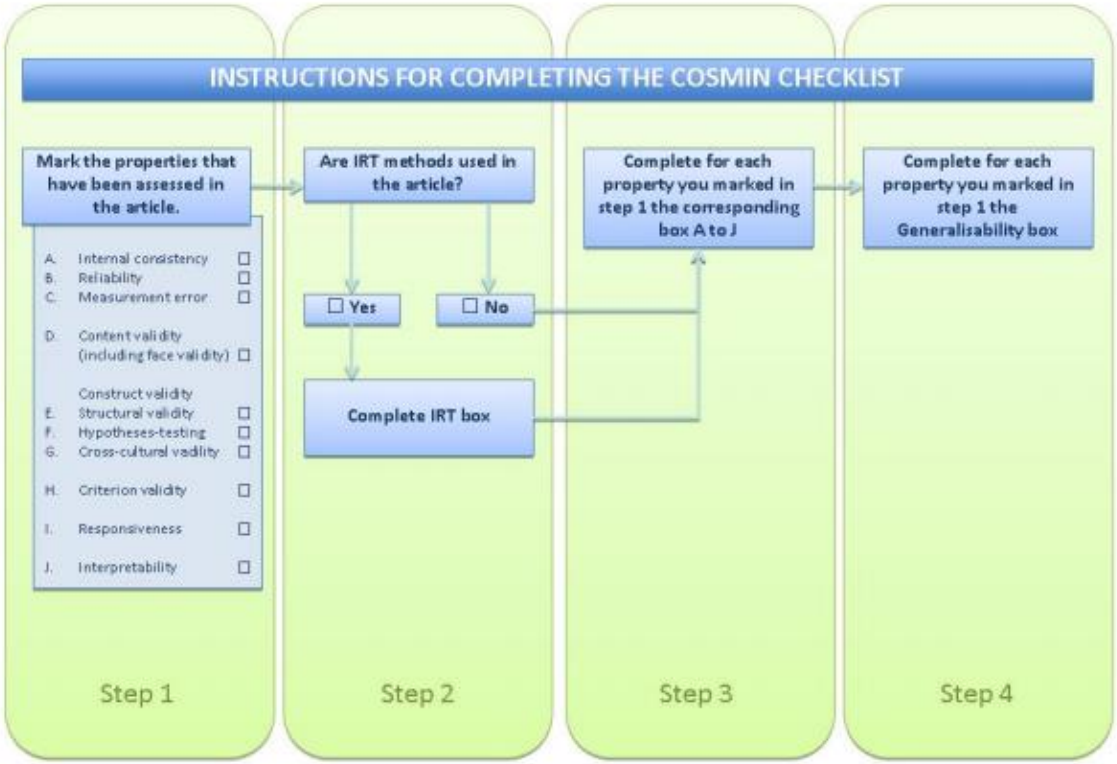
SIP survey pilot feedback log				
Location	**Comment**	**Action required**	**Action to be taken**	**Completed**
Under title	Thanks for agreeing to take part… remove the 'let the researcher know' part.	**Yes**		**x**
Start of survey	Details about phone call to be added			**x**
General	I didn't realise until later that you need to click for the middle answer to be recorded on the scales, might be worth highlighting it in bigger letters at the beginning. Also, I didn't fully read the blurb above each set of statements, maybe it would help to have section headings (e.g. "Online testing kits" or whatever).			
General	The text is too small			x
General	I think something about confidentiality should be said up front (or is it covered in advance comms?)			x
General	Make it more obvious when you are talking about online services			x
General	It is more usual to have agreement first on the scales			x
General	Interpretability of items relating to specific testing activities is difficult without interviewer involvement			
1. If you were to have an STI test next week	Do these randomise (the order) on each completion? If not, then you may find the respondents tick the top box			x
1. If you were to have an STI test next week	Make q1 multi answer			x
1. please specify	Repetition in the wording (answer this question if, answer this question if)	No need- this is an issue with the online/paper version		x
2. Thinking about getting an STI test	Scale hard to differentiate. Scale is unipolar while all of the rest are bipolar			x
2.b	The phrasing is a bit odd			x
2.f.	You can get other services (at the same time?) such as contraception, advice or to.			x
2.f.	YOUR gp not you gp.			x
4.	WHEN thinking about doing and STI….			x

5. STI kits are now available through	Keep wording consistent			x
5.a	I would trust that …			X
5.b.	I would trust that….			X
5.c	I would trust the accuracy of the test kit that is send to me			X
5.d.	I would trust the result if the test was positive (it said that I had something)			X
5.e	I would trust the result if the test was negative(it said that I didn't have something)			X
5.f.	I would trust the packaging			X
5.g.	I would trust the postal system to safely deliver my samples back to the lab			x
6.Now thinking about doing an STI test at home	Make more obvious where you are now.			x
6.	Start all questions with I would be able to			X
6.b.	Home STI testing kits would be easy to use			X
6.c.	I would be able to do the test at home as easily (accurately)			X
6.d.	If I got stuck, I would be able to .			X
7.a Now thinking about your friends and	7.a 7.b Many people and/ people like. is it deliberate?			x
6 and 7	The order of questions is a bit odd as you mix the qs relating to the clinic and the qs relating to the online			x
9.d. Thinking about your sexual health	I am involved in decisions about MY SEXUAL HEALTH			x
12	Remove commas!			x
12.c. Rate how likely it would be that a doctor or nurse	YOU had anal sex			X
12.d	YOU had sex with lots of different people			X
13.	Reorganise options. More than part time. Find source. Student. More than full time			x
14.	Options Live with spouse			x
14.	Live with people I don't know.			x

Appendix S: Cosmin Checklist

Completion of the COSMIN checklist

“The COSMIN checklist should be used as a modular tool. This means that it may not be necessary to co mplete the whole checklist when evaluating the quality of a particular study”



Step 1

Property assessed		**Location in thesis**	**Method**
Internal consistency	A	Chapter X stage 2	Cronbach’s Alpha
Reliability	**B**	Chapter X stage 2	Test-retest
Content validity, face validity and construct validity	C	Face validity Chapter X	Panel discussion
Structural validity	F	Chapter X stage 2	CFA

Step 2

IRT completed because CFA is equivalent to IRT

Table 1: IRT box for CFA

Box requirements	Met?	Description

Was the IRT model used adequately described? e.g. One Parameter Logistic Model (OPLM), Partial Credit Model (PCM), Graded Response Model (GRM)	Yes	SEM standardised single factor model ADF estimators
Was the computer software package used adequately described? e.g. RUMM2020, WINSTEPS, OPLM, MULTILOG, PARSCALE, BILOG, NLMIXED	Yes	STATA15
Was the method of estimation used adequately described? e.g. conditional maximum likelihood (CML), marginal maximum likelihood (MML)	Yes	Asymptomatic distribution free
Were the assumptions for estimating parameters of the IRT model checked? e.g. unidimensionality, local independence, and item fit (e.g. differential item functioning (DIF))	Yes	GoF indicators CFI TLI RMSEA X2

Step 3

BOX A internal consistency

Question	Yes	No	NA
1. Does the scale consist of effect indicators, i.e. is it based on a reflective model?	x		
2 Was the percentage of missing items given?	x		
3 Was there a description of how missing items were handled?			x
4 Was the sample size included in the internal consistency analysis adequate?	x		
5 Was the unidimensionality of the scale checked? i.e. was factor analysis or IRT model applied	x		
6 Was the sample size included in the unidimensionality analysis adequate?	x		
7 Was an internal consistency statistic calculated for each (unidimensional) (sub)scale separately	x		
8 Were there any important flaws in the design or methods of the study?		x	

Statistical methods			
9 for Classical Test Theory (CTT): Was Cronbach's alpha calculated?	x		
10 for dichotomous scores: Was Cronbach's alpha or KR-20 calculated?			x
11 for IRT: Was a goodness of fit statistic at a global level calculated? e.g. $\chi 2$, reliability coefficient of estimated latent trait value (index of (subject or item) separation)	x		

Box B test-retest reliability

Question	Yes	No	NA	?
1. Was the percentage of missing items given?	x			
2 Was there a description of how missing items were handled?			x	
3 Was the sample size included in the analysis adequate?				x
4 Were at least two measurements available?	x			
5 Were the administrations independent?	x			
6 Was the time interval stated?	x			
7 Were patients stable in the interim period on the construct to be measured?	x			
8 Was the time interval appropriate?	x			
9 Were the test conditions similar for both measurements? e.g. type of administration, environment, instructions	x			
10 Were there any important flaws in the design or methods of the study?		x		
11 for continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	x			
12. for dichotomous/nominal/ordinal scores: Was kappa calculated?			x	
13 for ordinal scores: Was a weighted kappa calculated?			x	
14 for ordinal scores: Was the weighting scheme described? e.g. linear, quadratic			x	

Box D Content Validity

Question	Yes	No	NA	?
1. Was there an assessment of whether all items refer to relevant aspects of the construct to be measured?	x			
2 Was there an assessment of whether all items are relevant for the study population? (e.g. age, gender, disease characteristics, country, setting)	x			

3 Was there an assessment of whether all items are relevant for the purpose of the measurement instrument? (discriminative, evaluative, and/or predictive)	x				Box E
4 Was there an assessment of whether all items are relevant for the purpose of the measurement instrument? (discriminative, evaluative, and/or predictive)	x				
5 Were there any important flaws in the design or methods of the study?		x			
7 Were patients stable in the interim period on the construct to be measured?					
8 Was the time interval appropriate?					
9 Were the test conditions similar for both measurements? e.g. type of administration, environment, instructions					
10 Were there any important flaws in the design or methods of the study?		x			
11 for continuous scores: Was an intraclass correlation coefficient (ICC) calculated?	x				
12. for dichotomous/nominal/ordinal scores: Was kappa calculated?			x		
13 for ordinal scores: Was a weighted kappa calculated?			x		
14 for ordinal scores: Was the weighting scheme described? e.g. linear, quadratic			x		

Structural Validity

Question	Yes	No	NA	?	
1. Does the scale consist of effect indicators, i.e. is it based on a reflective model?	x				Step 4
2 Was the percentage of missing items given?	x				Box
3 Was there a description of how missing items were handled?			x		
4 Was the sample size included in the analysis adequate?	x				
5 Were there any important flaws in the design or methods of the study?		x			
6 for CTT: Was exploratory or confirmatory factor analysis performed?	x				
7 for IRT: Were IRT tests for determining the (uni-) dimensionality of the items performed?			x		

Generalisability

Question	Yes	No	NA	?
1. median or mean age (with standard deviation or range)?	x			
2 distribution of sex?	x			
3 important disease characteristics (e.g. severity, status, duration) and description of treatment?	x			

4 setting(s) in which the study was conducted? e.g. general population, primary care or hospital/rehabilitation care	x			
5 countries in which the study was conducted?	x			
6 language in which the HR-PRO instrument was evaluated?	x			
7 Was the method used to select patients adequately described? e.g. convenience, consecutive, or random	x			
8 Was the percentage of missing responses (response rate) acceptable?	x			

Appendix T: Loadings of eleven rotated factor patterns using polychoric correlation and maximum likelihood estimations N=129

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
Feelings about convenience when testing											
a. You get your result quickly	0.14	-0.01	0.11	0.75	0.08	0.24	-0.04	-0.12	-0.06	0.13	0.24
b. You don't have to wait too long for a test in the waiting room	-0.05	0.28	0.04	0.79	0.03	-0.01	-0.08	0.02	0.15	-0.06	-0.06
c. You can take a test as soon as possible	0.14	-0.08	0.18	0.71	0.05	0.15	-0.14	0.37	-0.06	0.11	0.01
d. You take a test at a time that suits you	-0.15	0.12	0.11	0.63	0.13	0.06	-0.15	0.39	0.17	0.19	-0.10
e. You don't have to wait for an appointment	0.00	0.22	-0.01	0.81	0.11	0.08	0.19	0.03	0.10	0.07	0.11
f. You can get other services such as contraception, advice or see you GP	0.05	0.14	-0.12	0.36	-0.32	0.01	0.13	0.55	0.02	-0.13	0.07
g. You can see a doctor or nurse	0.19	0.11	0.07	0.30	-0.11	0.12	0.15	0.66	-0.21	0.05	0.30
Trust in clinic services											
a. The information that I receive at a clinic is accurate and up to date	0.22	-0.15	0.05	0.11	0.14	0.76	-0.05	0.21	-0.06	0.11	0.03
b. Any information about me is stored safely at the clinic	0.41	-0.04	0.21	0.14	0.15	0.69	-0.01	-0.09	-0.06	0.03	0.07
c. I trust the results are accurate from an STI test that is done in a clinic	0.21	-0.22	0.01	0.13	0.11	0.76	-0.12	0.14	0.09	0.19	0.06
d. The test kits they use at the	0.36	0.00	0.00	0.18	0.25	0.62	-0.21	0.20	0.19	0.07	0.07

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
clinic are accurate											
Trust in online services											
a. The information that is on a website like this is accurate and up to date	0.61	-0.11	0.25	0.03	0.23	0.38	-0.04	0.04	0.22	0.18	-0.13
b. Any personal information that I would enter into the website would be stored safely	0.70	0.02	0.24	0.08	0.00	0.30	-0.08	-0.14	0.00	0.15	-0.08
c. I would trust the result from the test kit that is sent to me is accurate	0.84	-0.10	0.08	-0.03	0.09	0.16	-0.25	0.14	0.14	0.18	0.02
d. If the test result was positive (that I had something), I would trust it	0.82	-0.11	-0.07	-0.02	0.18	0.01	-0.16	0.03	0.00	0.17	-0.05
e. If the test result was negative (that I didn't have an infection), I would trust it	0.80	-0.19	0.13	0.11	-0.02	0.16	0.01	0.14	0.19	0.08	-0.10
f. The test kit they would send is as accurate as the ones they use in a clinic	0.84	-0.09	0.02	0.09	0.10	0.22	0.10	-0.13	0.12	-0.08	-0.00
g. I trust that they would send me the test kit in a package that doesn't look like it's an STI test.	0.80	-0.06	-0.03	0.01	0.07	0.08	-0.01	0.01	0.18	0.08	0.07
h. I would trust the postal system to deliver my samples back	0.86	-0.05	-0.06	-0.09	0.16	-0.05	-0.11	0.05	0.00	0.09	-0.02

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
to the lab safely											
Self-efficacy to self-test											
a. If doing the test meant that I would have to prick my finger I would be able to do it	0.16	0.04	-0.14	0.16	-0.04	0.09	-0.10	-0.05	0.17	0.75	0.03
b. Home STI kits are easy to use	0.36	-0.15	0.11	0.07	0.18	0.15	0.15	-0.03	0.07	0.72	-0.05
c. I would be able to do the test at home as accurately as I could at the clinic	0.33	0.17	-0.02	0.18	0.16	0.22	0.09	0.05	0.35	0.63	0.15
d. If I got stuck, I would know where to get help	0.41	-0.07 -	-0.15	0.04	0.15	0.11	0.07	0.12	0.29	0.52	0.20
Professional support											
a. When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result	0.08	0.01	0.04	-0.08	0.07	0.04	0.06	0.52	-0.12	0.13	0.40
b. I like that doctors and nurses are able to give me advice that is specifically for me	0.06	-0.04	-0.13	0.01	0.06	0.18	0.00	0.73	-0.07	-0.14	0.19
c. I like that doctors and nurses in clinics encourage me to have safe sex	0.06	0.02	-0.08	0.05	0.12	0.15	-0.07	0.66	-0.01	-0.04	0.18
d. It helps to have a doctor or nurse around when you're doing taking the samples for an STI test	-0.17	0.09	0.09	-0.02	0.13	0.18	-0.06	0.38	0.07	0.04	0.73

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
e. It doesn't feel right to do an STI test without a doctor or nurse to help you	-0.04	0.19	0.12	0.19	-0.06	0.00	0.07	0.17	-0.13	-0.12	0.82
HCS											
a. I know enough about my sexual health	0.18	0.01	-0.08	0.13	0.84	0.02	-0.11	-0.11	0.13	0.03	0.04
b. I can look after my sexual health	0.14	-0.15	-0.08	0.08	0.79	0.02	0.07	0.06	0.22	0.12	0.08
c. I can get the right help if I need it	0.14	-0.17	0.05	0.07	0.77	0.28	-0.03	-0.05	0.00	0.03	0.13
d. I am involved in decisions about me	0.21	-0.28	-0.01	0.00	0.77	0.22	-0.03	0.18	0.14	0.06	-0.11
Subjective norms											
a. Many people like me take responsibility for our own health	0.01	0.11	-0.19	0.03	0.15	0.43	-0.15	0.22	0.42	0.18	0.10
b. People like me would use online services for STI testing	0.16	0.09	-0.01	0.11	0.12	0.03	-0.03	-0.06	0.85	0.12	0.01
c. People like me would test at home for STIs	0.32	-0.06	0.05	0.04	0.17	0.04	0.09	-0.05	0.80	0.21	-0.10
d. People like me like using new health services	0.16	-0.11	0.01	0.07	0.20	-0.03	0.25	-0.17	0.61	0.00	-0.07
Shame clinic											
a. I would feel ashamed	0.09	0.28	0.87	0.07	-0.08	0.10	0.13	-0.02	0.07	0.00	0.02
b. I would feel embarrassed	0.04	0.20	0.89	0.03	0.03	0.17	0.13	-0.08	-0.04	0.04	0.01
c. I would feel guilty	0.04	0.34	0.81	0.14	-0.14	-0.03	0.13	0.07	0.00	-0.10	0.17
d. I would feel worried	0.07	0.40	0.84	0.03	-0.03	0.14	0.13	-0.03	-0.02	0.04	0.04
Stigma clinic											

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
a. People would avoid you	-0.05	0.84	0.16	0.08	-0.04	0.13	0.21	-0.07	-0.11	-0.09	0.04
b. People would think you were unclean	-0.01	0.86	0.29	0.08	-0.07	0.00	0.07	0.16	0.02	-0.08	-0.06
c. Other people would think badly of you	-0.12	0.88	0.32	0.03	-0.05	-0.05	0.10	0.09	-0.04	0.00	-0.01
d. Other people would not want to be friends with you	-0.09	0.89	0.08	0.10	-0.12	-0.10	0.20	-0.01	0.06	-0.06	0.11
e. Other people would be disgusted by you	-0.10	0.90	0.09	0.15	-0.12	-0.09	0.19	-0.07	0.01	0.00	0.15
f. Other people would be uncomfortable around you	-0.13	0.87	0.21	-0.04	-0.04	-0.16	0.18	0.04	0.00	0.01	0.00
Judgement											
a. You had sexual intercourse	-0.10	0.52	0.05	0.07	-0.15	-0.04	0.72	-0.05	0.07	0.07	0.15
b. You had oral sex,	-0.07	0.42	0.13	0.08	-0.04	-0.08	0.82	-0.05	0.05	0.00	0.16
c. Had anal sex,	-0.18	0.42	0.26	-0.09	-0.02	-0.10	0.74	0.07	0.06	0.03	-0.09
D. Had sex with lots of different people	-0.14	0.29	0.28	-0.16	0.05	-0.08	0.72	0.11	0.00	0.01	-0.18

Appendix U: Loadings (≥0.40) of eleven factor patterns using polychoric correlation and maximum likelihood estimations N=129

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
Feelings about convenience when testing											
a. You get your result quickly		0.43			-0.46						
b. You don't have to wait too long for a test in the waiting room		0.41			-0.56						
c. You can take a test as soon as possible		0.41	0.53								
d. You take a test at a time that suits you			0.47								
e. You don't have to wait for an appointment		0.53									
f. You can get other services such as contraception, advice or see you GP			0.48			0.41					
g. You can see a doctor or nurse		0.43	0.60								
Trust in clinic services											
a. The information that I receive at a clinic is accurate and up to date	0.53										
b. Any information about me is stored safely at the clinic	0.50										
c. I trust the results are accurate from an STI test that is done in a clinic	0.62										

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
d. The test kits they use at the clinic are accurate	0.62										
Trust in online services											
a. The information that is on a website like this is accurate and up to date	0.67										
b. Any personal information that I would enter into the website would be stored safely	0.51	0.44									
c. I would trust the result from the test kit that is sent to me is accurate	0.74										
d. If the test result was positive (that I had something), I would trust it	0.68	0.41									
e. If the test result was negative (that I didn't have an infection), I would trust it	0.66	0.45									
f. The test kit they would send is as accurate as the ones they use in a clinic	0.61	0.45									
g. I trust that they would send me the test kit in a package that doesn't look like it's an STI test.	0.59										
h. I would trust the postal system to	0.61										

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
deliver my samples back to the lab safely											
Self-efficacy to self-test											
a. If doing the test meant that I would have to prick my finger I would be able to do it											
b. Home STI kits are easy to use	**0.52**										
c. I would be able to do the test at home as accurately as I could at the clinic	**0.51**										
d. If I got stuck, I would know where to get help	**0.52**										
Professional support											
a. When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result			**0.41**		**0.43**						
b. I like that doctors and nurses are able to give me advice that is specifically for me			**0.59**								
c. I like that doctors and nurses in clinics encourage me to have safe sex			**0.58**								
d. It helps to have a doctor or nurse around when you're doing taking the			**0.57**							**0.43**	

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
samples for an STI test											
e. It doesn't feel right to do an STI test without a doctor or nurse to help you			0.50							0.54	
HCS											
a. I know enough about my sexual health	0.45			0.42			0.44				
b. I can look after my sexual health	0.49			0.46							
c. I can get the right help if I need it	0.52					-0.47					
d. I am involved in decisions about me	0.64					-0.42					
Subjective norms											
a. Many people like me take responsibility for our own health								-0.42			
b. People like me would use online services for STI testing				0.49					0.41		
c. People like me would test at home for STIs	0.47			0.41							
d. People like me like using new health services				0.41							
Shame clinic											
a. I would feel ashamed		0.67									
b. I would feel embarrassed		0.59				-0.53					
c. I would feel guilty		0.64									
d. I would feel worried		0.64									

Domain	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11
Stigma clinic											
a. People would avoid you	-0.56	0.57									
b. People would think you were unclean	-0.53	0.65									
c. Other people would think badly of you	-0.63	0.61									
d. Other people would not want to be friends with you	-0.65	0.56									
e. Other people would be disgusted by you	-0.65	0.58									
f. Other people would be uncomfortable around you	-0.67	0.53									
Judgement											
a. You had sexual intercourse	-0.55	0.49									
b. You had oral sex,	-0.52	0.50									
c. Had anal sex,	-0.58	0.43									
D. Had sex with lots of different people	-0.47										

N=129. Retained factors =11. Number of parameters=495. Maximum likelihood estimation. Results omitted for factor loadings <0.40.

Appendix V: Item level correlations

Equivalence reliability for items and scales in the final CMS N=877

Construct		Item-test correlation	Item-rest correlation	Average inter-item correlation if item is deleted	Alpha if item deleted	Inter-item correlation	Cronbach's alpha
Convenience when testing	a.	0.60	0.32	0.23	0.54	0.22	0.58
	b.	0.59	0.31	0.23	0.54		
	c.	0.66	0.41	0.19	0.49		
	d.	0.51	0.21	0.27	0.59		
	e.	0.70	0.46	0.17	0.46		
Trust in clinic services	a.	0.84	0.71	0.61	0.82	0.61	0.86
	b.	0.81	0.66	0.64	0.84		
	c.	0.85	0.72	0.60	0.82		
	d.	0.86	0.74	0.59	0.81		
Trust in online services	a.	0.82	0.76	0.55	0.90	0.56	0.91
	b.	0.81	0.75	0.55	0.90		
	c.	0.87	0.82	0.54	0.89		
	d.	0.75	0.67	0.57	0.90		
	e.	0.81	0.74	0.56	0.90		
	f.	0.80	0.73	0.56	0.90		
	g.	0.72	0.63	0.58	0.91		
	h.	0.70	0.61	0.59	0.91		
Self-efficacy to self-	a.	0.87	0.75	0.53	0.77	0.58	0.85
	b.	0.79	0.62	0.62	0.83		
	c.	0.89	0.79	0.51	0.76		
	d.	0.76	0.57	0.65	0.85		
Professional support	a.	0.79	0.65	0.37	0.70	0.41	0.78
	b.	0.73	0.56	0.40	0.73		
	c.	0.61	0.39	0.48	0.79		
	d.	0.75	0.58	0.40	0.72		
	e.	0.75	0.58	0.39	0.72		
Health Confidence Score	a.	0.80	0.63	0.52	0.76	0.52	0.81
	b.	0.83	0.70	0.49	0.74		
	c.	0.78	0.60	0.54	0.78		
	d.	0.79	0.61	0.53	0.77		
Subjective norms	a.	0.92	0.51	0.57	0.73	0.67	0.86
	b	0.92	0.51	0.54	0.72		
	c.	0.81	0.59	0.86	0.93		
Shame	a.	0.90	0.81	0.59	0.81	0.64	0.88
	b.	0.81	0.66	0.69	0.87		
	c.	0.85	0.73	0.65	0.84		
	d.	0.86	0.75	0.63	0.84		
Stigma	a.	0.83	0.75	0.68	0.91	0.67	0.92
	b.	0.85	0.78	0.67	0.91		
	c.	0.85	0.78	0.67	0.91		
	d.	0.89	0.84	0.65	0.90		
	e.	0.87	0.81	0.66	0.91		
	f.	0.82	0.73	0.69	0.92		

Judgement	a.	0.85	0.73	0.64	0.84	0.64	0.88
	b.	0.90	0.82	0.58	0.81		
	c.	0.88	0.78	0.61	0.82		
	d.	0.78	0.61	0.72	0.89		

Appendix W: Participant Information Sheet (Survey)

Participant Information Sheet

We are inviting you to take part in a research study. Before you decide, it is important that you know why we are doing the study and what is involved. Please read the following information carefully.

What is the purpose of the study?

This study is to help us understand what influences people's decisions to use online sexual health services for testing for sexually transmitted diseases. We hope the information we gain from this study will help us to improve online sexual health services.

Why have I been chosen?

You have been chosen because you took part in the 'gettested' study and you ticked a box that said you were happy to be contacted for further research.

Do I have to take part?

No, it is up to you to decide whether you would like to take part.

What will happen if I take part?

You will be directed to a survey which you will be asked to complete online. Within two weeks after you have completed the survey, we will phone you to complete the telephone part of the survey. Once you have completed that we will send you your compensation. The study team will receive and enter your answers in a database and pair them with the data we have from when you participated in the 'gettested' trial.

Will you compensate me for the time this takes?

We will give you £10 for completing the survey.

What are the alternatives?

You do not have to take part.

What are the possible disadvantages in taking part?

Completing the surveys will take up some of your time.

What are the possible benefits of taking part?

Taking part in this study will help us understand how to help people get the sexual health services they need.

You may find thinking about what you liked and didn't like about the service useful, particularly if you're thinking about using a similar service again.

What happens when this study stops?

The survey will help us understand what people do and don't like about online services and what people do and don't like about sexually transmitted infection testing at home. We want to know this because we want to improve sexual health services in order to help as many people as possible.

What will happen if I don't want to carry on with the study?

You can withdraw at any time by letting the Study Coordinator know. You do not have to give a reason for wanting to withdraw.

What if there is a problem?

If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions [Dr Paula Baraitser, 0207 848 5168, paula.baraitser@kcl.ac.uk].
If you remain unhappy and wish to complain formally, you can do this through the Guy's and St Thomas' Patients Advice and Liaison Service (PALS) on 020 7188 8801, **pals@gstt.nhs.uk**. The PALS team are based in the main entrance on the ground floor at St Thomas' Hospital and on the ground floor at Guy's Hospital in the Tower Wing.
In the event that something does go wrong and you are harmed during the research you may have grounds for legal action for compensation against King's College Hospital NHS Foundation Trust and/or King's College London but you may have to pay your legal costs..

Will my taking part in this study be kept confidential?

Yes. What you say in your survey will be stored anonymously. Your contact details will be kept confidential and will not be shared with anyone outside the research team. We will not inform any of your family or friends or your GP about your involvement in this research.

What will happen to the results of the research study?

The results will be published in a scientific journal so that other people know about it. If you would like a copy of the results, please contact the Study Coordinator.

Who is organising and funding the research?

The study is run by Dr Paula Baraitser (Chief Investigator) from Kings College London, at the University of London. The research is being funded by Guy's and St Thomas' charity (http://www.gsttcharity.org.uk/).

Who has reviewed the trial?

The NHS Medical Research Ethics Committee and Kings College Hospital NHS Foundation Trust.

Thank you for taking the time to consider taking part.

If you would like further information, please contact Sharmani Barnard

The team contact details

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Appendix X: Participant Consent (Survey)

Get Tested SIP Survey

Letting us know if you're happy to take part

KING'S College LONDON

If you are happy to take part in the study, please read the following statements carefully and tick all boxes ANSWER REQUIRED

- ☐ I confirm that I have read and understand the information sheet [version 2, 2015] for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
- ☐ I understand that my participation is voluntary (my choice) and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.
- ☐ I understand that all information I provide will remain confidential in accordance with the Data Protection Act of 1998 and will only be used for the purposes of the study. Only the research team directly involved with the study will have access to this information.
- ☐ I understand that relevant sections of data collected during the study, may be looked at by individuals from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.
- ☐ I understand that relevant sections of data collected during the study will be paired with relevant sections of data from the 'gettested' trial by the study team. I give permission for this to happen.
- ☐ I agree to take part in the above study.

Appendix Y: Study Protocol for Survey

DEMOGRAPHIC, SOCIAL AND PSYCHOLOGICAL FACTORS THAT INFLUENCE USE OF ONLINE SERVICES FOR STI TESTING

1.1.1 BACKGROUND

Good sexual health is fundamental to the physical and emotional health and well-being of individuals, couples and families [1]. Sexually transmitted infections (STIs) impact on sexual and reproductive health which causes significant morbidity and mortality globally [1]. Health consequences of STIs range from mild acute illnesses to long term complications such as genital cancers, subfertility, ectopic pregnancy and pelvic inflammatory disease [2]. STIs also facilitate the spread of Human Immunodeficiency Virus (HIV) [3].

Globally, STIs rank among the top five disease categories for which adults seek health care [4]. Europe has the fourth highest incidence of new cases of STIs of the six global regions of the World Health Organization (WHO), with 46.8 million new cases of chlamydia, gonorrhoea, syphilis and trichomonas annually [5]. In England, STIs are a major public health concern. The incidence of syphilis, gonorrhoea and chlamydia is rising and there is substantial undiagnosed HIV infection in the population [6, 7]. Between 2013 and 2014, there were sharp increases in diagnoses of infectious syphilis (33% increase; from 3,236 to 4,317) and gonorrhoea (19% increase; from 29,419 to 34,958) [6]. Chlamydial diagnoses increased between 1990 and 2014 [6]; in 2014 chlamydia was the most commonly diagnosed STI, accounting for 47% of all STI diagnoses [6, 8]. In addition, although the prevalence of HIV in England is relatively low (2.8/1000 for people aged 15-59 years), it is estimated that there are over 26,000 people infected with HIV and unaware of their infection, highlighting the need for increased testing [7].

As HIV, syphilis, chlamydia and gonorrhoea are infectious and often asymptomatic, diagnostic testing is key to ensure those infected receive treatment and thus prevent ongoing transmission [10]. If STIs are undetected within a population, opportunities to reduce onward transmission such as behaviour change interventions or treatments are missed [11]. In order for diagnostic testing to be effective at reducing prevalence of infection, it needs to be targeted at groups with highest need for testing [12]. In the UK, STIs are distributed heterogeneously amongst the population [9]. Risk of STI infection varies by ethnicity, age, and sexual preference [9]. STI rates are highest among men who have sex with men (MSM), individuals aged under 25 years and black African men and women who have condomless sex [6, 7].

Recently, several service innovations have been introduced to improve access to STI testing [33, 34], including online services for STI self-sampling at home. SH:24 is one of these online services that offers free postal STI self-sampling kits for chlamydia, gonorrhoea, HIV and syphilis to residents of Lambeth and Southwark. The service aims to increase the provision of STI testing in the population which will address unmet need while also moving basic STI testing from the clinic setting to the online setting. By shifting basic STI testing online, SH:24 aims to increase clinic capacity and the cost efficiency of STI testing and thus increasing the availability of clinic services for more complex cases.

An analysis of routinely collected service use data for STI testing in Lambeth and Southwark indicates that online services use differs by age, gender, ethnicity and sexual orientation (ref). When compared to clinic services, women are more likely to use online services than men, people of white ethnicity are more likely to use online services than people of other ethnicities, younger people are more likely to use online services than older people and homosexual people are more likely to use online services than heterosexual people. Theories of access to healthcare acknowledge that the factors that influence access is complex and includes numerous individual factors including biological, psychological, and social factors (ref Anderson++). Evidence from qualitative research with users of SH:24 confirms this, suggesting that the factors that influence service channel use for STI testing include social factors such as the conditions in which someone lives and works and psychological factors such as someone's trust in services or their feelings about shame about STIs. Include more on completion of qual.

Questions remain as to what are the factors that influence service channel use for STI testing. By going beyond biological factors to understand the role that social and psychological factors play, service providers can gain a better understanding of the underlying factors that influence service use and thus how to address these factors to increase access to those with most need.

1.1.2 RESEARCH QUESTION

What are the individual (demographic, social, and psychological) factors that influence service channel use for STI testing in Lambeth and Southwark?

1.1.3 STUDY SETTING

This study will be carried out in the London boroughs of Lambeth and Southwark. These boroughs have some of the highest rates of STIs in England [47, 48]. In 2014 Lambeth had the highest national rate of all new STI diagnoses and chlamydia detection rates in 16-24 year olds [47]. In the same year, Southwark had the 4th highest STI diagnosis rates in the country [48]. In addition, Lambeth and Southwark have the country's highest diagnosed HIV prevalence at 14.7/1000 and 12.5/1000 respectively [47, 48].

Sexual health services in Lambeth and Southwark are free, available to anyone who attends and anonymous. The majority of services are available on a 'walk in' basis, with appointments made available to chronic cases including HIV and genital wart patients. Two genitourinary medicine clinics and two community clinics deliver 120,000 sexual health services in the boroughs each year. These services range from pregnancy testing and provision of contraceptives and STI testing to referrals for abortion services, HIV post exposure prophylaxis and psychosexual counselling .

Despite the delivery of a large number of sexual health services in the boroughs of Lambeth and Southwark, each year the need for sexual health services outstrips supply. In 2013 over 17,000 individuals were turned away from services due to a lack of resources .In addition, of those that are able to see a clinician on the day they attend, over half wait more than one hour . This gap has coincided with an increase in diagnosis

of STIs; between 2009 and 2014 rates of syphilis and gonorrhoea tripled in both boroughs while HIV prevalence increased and chlamydia detection rates remained consistently high [47, 48].

1.1.4 STUDY POPULATION

All individuals that took part in the 'gettested' RCT that indicated that they would be happy to take part in future research will be invited to take part in the survey. Participants of the 'gettested' RCT were recruited from universities, colleges and through social media between November 2014 and July 2015.
The inclusion criteria for the 'gettested' trial were as follows:

- Resident of Lambeth or Southwark
- 16 years or older
- Have had at least one sexual partner in the past 12 months
- Willing to take an STI test

Trial participants were randomised to the intervention arm or the control arm. Those in the intervention arm received a text message to encourage them to use online services for STI testing at home and those in the control arm received a text message that encouraged them to use GUM clinic services for STI testing. Examples of the message text can be found in Box 1.
Outcome data were collected on self-reported service use 6 weeks following randomisation. These data were then objectively verified using service records.

1.1.5 DESIGN

This is cross sectional study that uses existing RCT data and additional survey data. The study draws on three sources of data for both exposure and outcome measures. Exposure variables will be drawn from existing RCT data containing demographic measures and additional survey data from both electronic surveys (e-surveys) and telephone surveys (tele-surveys) measuring social, individual and psychological variables. Outcome measures will be drawn from both existing RCT data and survey data (Figure 1).
A post-trial mixed-methods survey will measure use of STI testing services, intended use of services and social, individual and psychological (SIP survey) factors. All eligible RCT participants will be sent a text message invitation to take part in the survey. The options given in the text message will include, 'yes please', 'no thank you' and 'more information please'. Those who choose the option 'yes' will be given electronic information about the survey and asked to complete electronic consent. Once consent has been received, participants will be redirected to an electronic survey (SIP e-survey). Once the SIP e-survey has been completed, participants will be followed up with a telephone survey (SIP tele-survey). If 'more information please' is selected, researchers will contact the participant by telephone to invite them to take part. Attempts will be made to engage non responders using email, text and telephone invitations. Reminders will be sent if a participant has consented to take part but has not completed the SIP e-survey. See Figure 2 for the order of events.

1.1.6 AIM

The overall aim of this study is to describe and differentiate the individual (demographic, social, and psychological) factors that influence the use of clinic sexual health services and online services for STI testing in Lambeth and Southwark.

1.1.7 STUDY OUTCOMES

Primary outcome:

To determine how demographic, social, individual and psychological factors differ between online service and users of face-to-face services for STI testing at trial follow up.

Secondary outcomes:

To determine how demographic, social, individual and psychological factors differ between participants in the intervention arm that did not use the online service and participants in the clinic arm who did not use the clinic service.

To determine how demographic, social, individual and psychological factors differ between participants with any use of online services for STI testing in the survey period and those with no use of online services.
To determine how demographic, social, individual and psychological factors differ between participants that only used online services for STI testing and those only used face-to-face services.

To determine the demographic, social, individual and psychological factors differ between participants who intend to use online services in the future compared to those who intend to use face-to-face services in the future.

To determine the relationship between perceived risk of infection and service channel use.

To determine the relationship between perceived type of infection and service channel use.

1.1.8 VARIABLES

Exposure variables:

Participants demographic data and will be sourced from the existing RCT data. This data includes date of birth, gender, sexual orientation, ethnicity and postcode. RCT data also contains information relating to social factors including; STI test since last change of partner; number of sexual partners in the past 12 months; last STI test (when); last STI test (where). The randomisation group which the participant was assigned to will be considered an exposure variable when analysing non-RCT outcomes.

Additional data will be gathered through SIP survey questions. Measures of convenience, the value of a health care provider (HCP) during testing, trust in clinic sexual health services, trust in online sexual health services, self-efficacy to self-test, health confidence, stigma, shame and perceived judgement from providers will be measured using multiple item scales. Perceived risk of infection at time of testing will be

measured using a single item, asked over the phone. Participants will also be asked about who they live with, their work/study hours at the time of testing and whether they had ever been diagnosed with an STI. All measures are self-reported by patients. Table one describes the variables, variable type and description and source of variable for exposure variables.

Outcome variables

Use of services in the period between trial participation and SIP survey will self-reported in telephone surveys and objectively verified using service data. Intended use will be self-reported in SIP e-surveys. Table two describes the variables, variable type and description and source of variable for outcome variables.

Table 1- Exposure Variables

Variable	Variable type	Source and reliability (if applicable)	Description	Location
Demographic and individual variables				
Age	Numeric		Reported as DOB by patient. Analysed in years.	RCT baseline
Gender	Categorical		Male/Female/ Transgender As reported by participant	RCT baseline
Sexual Orientation	Categorical	GUMCAD	Heterosexual/ Gay/Lesbian/ Bi-sexual/ Prefer not to say As identified by participant	RCT baseline
Number of sexual partners 12 months	Numeric		As reported by participant at enrolment	RCT baseline
Ethnicity	Categorical	ONS	As per the classification used for the 2001 census: White: British/Irish/ Any other White background Mixed: White and Black Caribbean/ White and Black African/ White and Asian / Any other mixed background Asian or Asian British: Indian/ Pakistani/ Bangladeshi/ Any other Asian background Black or Black British: Caribbean /African/ Any other Black background Other Ethnic Groups: Chinese/ Any	RCT baseline
Last STI test when	Ordinal	Emma Wilson (EW)	In the last 3 months 3-6 months 6-12 months More than 12 months Never Reported by participant at time of enrolment	RCT baseline
Last STI test where	Categorical	EW	Sexual health Clinic GP Hospital Pharmacy Ordered on the internet Reported by participant at time of enrolment	RCT baseline
Postcode /IMD	Categorical		Indices of multiple deprivation derived from postcode data using 2011	RCT baseline / updated at survey
Randomisation	Binary		Control or Intervention	RCT
Social variables				
Hours of work/study	Categorical	Sharmani Barnard (SB)	What best describes the hours you work/study? I don't work/study I work/study office hours I work/study flexible hours I work shift work	SIP e-survey

What were the participants working hours at time of testing	Categorical	SB	What best describes the hours you worked when you had that test? Didn't work Office hours Flexible hours Shift work	SIP telesurvey
Who does the participant live with type	Categorical	ONS	Which of the following best describes the people who you live with? Live alone/ Live with Partner/Spouse/ Live with parents/ Live with family (not parents)/ Live with friends/ Live with others	SIP e-survey
Who did the participant live with at the time of testing	Categorical	ONS	Which of the following best describes the people who you were living with at the time that you took that test?	SIP telesurvey
Previous STI	Binary	SB	Have you ever been diagnosed with an STI?	SIP e-survey
Psychosocial variables				
Aspects of convenience of testing that participants value	5 point response scale	SB Piloted	7 items relating to convenience See appendix A for survey questions and answers	SIP e-survey
Value of health care providers during testing	5 point response scale	SB Piloted	5 items See appendix A for survey questions and answers	SIP e-survey
Trust in Clinic sexual health services	5 point response scale	SB	4 items See appendix A for survey questions and answers	SIP e-survey
Trust in Online sexual health services	5 point response scale	SB Piloted	6 items	SIP e-survey
Trust in self-test			4 items	SIP e-survey
Self-efficacy to self-test	5 point response scale	SB Piloted	4 items	SIP e-survey
Health confidence	5 point response scale	Health confidence score r-outcomes r-outcomes	4 items relating to knowledge, self- management, access and involvement See appendix A for survey questions and answers	SIP e-survey
Social norms for STI testing online	5 point response scale		4 items- See appendix A for survey questions and answers	SIP e-survey
STI related stigma	5 point response scale	Cunningham et al Alpha = 0.89	6 items See appendix A for survey questions and answers	SIP e-survey
STI related shame	5 point response scale	Cunningham et al Alpha- 0.91	5 items See appendix A for survey questions and answers	SIP e-survey

Perceptions about disclosure to a doctor or nurse	5 point response scale	Cunningham et al Alpha =0.81	4 items See appendix A for survey questions and answers	SIP e-survey
Variables relating to need for services				
Perceived risk of infection	5 point response scale	Asked to recall at the time of STI test including trial SB	At this time, can you rate how worried were you that you may have had an infection? 1 being not at all worried and 5 being extremely worried	SIP telesurvey
Perceived infection	5 point response scale	Asked to recall at the time of STI test including trial SB	Which STI did you think you were most at risk of having? (multiple answers may apply) HIV Syphilis Chamydia Gonnorrhoea	SIP telesurvey

Table 2 Outcome variables

Service use (trial)	Categorical	SH24 SH Clinic GP Other None	RCT data Objectively verified
Subsequent service use	Numerical	After the time we just spoke about, have you had any STI tests since? If yes, how many times	SIP telesurvey
Type of service use	Categorical	Where did you go for this test? Online (SH24) Online (Other).. please state GUM Camberwell Lloyds Wolworth Road Other clinic…please state GP please state	SIP telesurvey
Intended type of services use	Categorical	If you were going to have an STI test in the next week, which of the following services would you be most likely to use? Sexual health Clinic GP Hospital Pharmacy Ordered on the internet	SIP e-survey

1.1.9 MEASURE SELECTION AND LOCATION

Exposure measures:

Survey items were generated using existing frameworks for access to health care, empirical evidence of factors influencing access to services and via qualitative interviews with service users (Figure 1). Relevant frameworks relating to access to health services including Anderson's model for medical care utilisation, the theory of planned behaviour (TPB), the health belief model (HBM) and the health protection model

(HPM) were utilised to develop a framework of potential items for inclusion to the survey. Empirical evidence of the factors that influence use of STI testing services, home based STI self-sampling kits, rapid STI testing kits and online sexual health services was also consulted. Finally qualitative interviews with 20 service users were carried out to identify additional themes factors influencing access to online services for STI self-sampling at home.

Surveys were piloted on a convenience sample of 300 people.

Figure 3 – Generation of survey items

Demographic and social variables, where possible, were assessed using existing measures from the 'gettested RCT' or the Office of National Statistics (ONS). Others were developed internally and piloted for suitability. Psychosocial constructs for health confidence, stigma, shame and judgement were measured using existing scales, if necessary, adapting them to fit the context. Scales for convenience, trust, value of an HCP during testing, social norms and self-efficacy to self-test were developed based on existing literature on access to health and information gained through qualitative interviews. Once scales were developed, they were piloted within the population on a convenience sample of 300 clinic users to assess internal reliability.

Perceived risk of infection and perceived infection type were considered to be highly temporal (ref). In order to gain a measure of these in relation to a specific STI testing activity, these variables were measured using the SIP telesurvey. Work or study hours and who a participant lived with were also asked temporal to a STI specific testing activity using the SIP tele-survey as these were considered highly changeable and relevant to service channel choice. All other exposure variables were measured using the SIP e-survey.
Anderson's behavioural model for access to health services specifies that individual factors such as demographic, social and psychological factors may; be associated with need for services; enable someone to use services or; predispose someone to use services. A person's need for services is considered to be most proximal to use of services. If a person has need for services, then they must also have factors that enable them to use services. If someone has a need for a service and can use services, then they must be predisposed to using that type of service. Andersons framework applies to access to all health services and specify only a limited subset of social and physiological influences to service use. For a more complete explanation of service channel use specifically for STI testing we have extended these frameworks to include other relevant social and psychological influences on STI testing within this setting.

Measures

Convenience

Convenience will be measured with seven items. Respondents will be asked "Thinking about getting an STI test, rate how important the following things are to you" (e.g. "You get your results quickly"). The response scales for these items ranged from 1 (Not at all important) to 5 (extremely important). An overall

convenience scale will be constructed by taking the average of these seven items (Cronbach's α =; M = 3, SD=), with high scores reflecting higher need for convenient testing.

Value of a health care provider during STI testing

How highly respondents value the role of a health care provider (HCP) during STI testing will be measured using five items. Respondents will be asked "Still thinking about doing an STI test, rate your level of agreement with the following statements when" (e.g. "When I go to get a test, seeing a doctor or nurse makes me feel less scared about the test result"). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). An overall scale will be constructed by taking the average of these five items (Cronbach's α =; M = , SD=), with higher scores reflecting higher value in the role of a health care provider during testing.

Trust in clinic services

The level of trust that respondents have in using clinic services for STI testing will be measured using four items. Respondents will be asked "Still thinking about doing an STI test in a clinic, rate your level of agreement with the following statements when" (e.g. "The information that I receive at a clinic is accurate and up to date"). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). An overall scale will be constructed by taking the average of these four items (Cronbach's α =; M = , SD=), with high scores reflecting higher trust in clinic services.

Trust in online services for STI testing

The level of trust that respondents have in using online services for STI testing will be measured using four items. Respondents will be asked; "Now thinking about using an NHS online service to order STI test kits to do at home rate your level of agreement with the following statements" (e.g. "The information that is on a website like this is accurate and up to date"). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). An overall scale will be constructed by taking the average of these four items (Cronbach's α =; M = , SD=), with high scores reflecting higher trust in online services.

Self-efficacy to self-test

The level of trust that respondents have in their ability to self-sample for STIs at home will be measured using four items. Respondents will be asked; "Now thinking about doing an STI test at home (where the test kit is sent to your house and you take the samples at home to send back to the lab) rate your level of agreement with the following statements" (e.g. "If doing the test meant that I would have to prick my finger I would be able to do it"). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). An overall scale will be constructed by taking the average of these four items (Cronbach's α =; M = , SD=), with high scores reflecting higher trust ability to self-test at home.

Social Norms

Respondents' social norms will be measured using four items. Respondents will be asked; "Now thinking about your friends and people you know, rate your level of agreement with the following statements" (e.g.

“Many people like me take responsibility for our own health ”). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). An overall scale will be constructed by taking the average of these four items (Cronbach’s α =; M = , SD=), with high scores reflecting higher belief that it is normal to test at home.

Health Confidence Score

The four item Health Confidence Score (HCS) will be used to measure respondents’ confidence in their ability to manage their own sexual health and engage with health and care providers, access help as needed, and participate in shared decisions. It was developed in the UK involving surveys of the general public (n=1400). Respondents will be asked “Thinking about your sexual health, rate your level of agreement with the following statements” (e.g. “I know enough about my sexual health”). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree). Higher scores reflect higher health confidence.

Stigma

STI related stigma will be measured using six items. These items were developed to measure attitudes about STI related stigma among young African Americans in the USA. STD related stigma (six items; alpha = 0.89) reflected the participant’s expectation of negative interactions. In this survey, respondent’s will be asked; “Now thinking about if you had an STI and people knew about it, rate the following statements in terms of how likely it would be that” (e.g. “People would avoid you?”). The response scales for these items ranged from 1 (Extremely unlikely) to 5 (Extremely likely) with higher scores reflecting higher STI related stigma.

Shame

Perceived stigma will be measured using five items. These items were developed to measure attitudes about STI related shame among young African Americans in the USA. STI related shame (five items; alpha = 0.90) reflected the participant’s sense of shame and related side effects. Respondents will be asked; “Still thinking about if you had an STI, rate your level of agreement with the following statements” (e.g. “I would feel ashamed”). The response scales for these items ranged from 1 (Strongly disagree) to 5 (Strongly agree) with higher scores reflecting higher STI related shame.

Feelings about disclosure

Perceived judgment from health care providers will be measured using four items. These items (four items; alpha = 0.81) were developed to measure perceptions about disclosure of sexual behaviour to a doctor or nurse among young African Americans in the USA. Respondents will be asked; “Rate how likely it would be that a doctor or nurse would think less of you if you told them” (e.g. You had anal sex”). The response scales for these items ranged from 1 (Extremely unlikely) to 5 (Extremely likely). Higher scores reflect higher levels of negative perception about disclosure of sexual behaviour to a doctor or nurse.

Perceived risk of infection

Perceived risk will be measured using a single item asked in relation to time of testing using telephone surveys. Researchers will ask the participant to rate how worried they were that they had an infection for each time they tested and if they did not test by asking “At this time, can you rate how worried were you that you may have had an infection? 1 being not at all worried and 5 being extremely worried”. Higher scores will reflect higher perceived risk of infection.

Perceived infection

Perceived infection will be measured using a single item asked in relation to time of testing using telephone surveys. Researchers will ask the participant “Which STI did you think you were most at risk of having?”

Outcome measures:

Early piloting of outcome measures indicated increased accuracy of recall when participants were prompted by interviewers. All survey outcome measures, excluding intention to test, will be measured using the SIP-telesurvey. Intention to test proved easy for respondents in pilot therefore it remains part of the SIP e-survey.

1.1.10 DATA COLLECTION

Surveys

Invitation texts and emails will be sent to all ‘gettested’ trial participants who indicated that they would be happy to take part in further research. The invitations will notify participants about the survey, giving details of the aims for the study, the length of time it will take to carry out and the remuneration they would receive for taking part. Invitation text will give recipients the option of ‘I’d like to take part’, ‘I’d like to know more about this first’ or ‘No thanks, I’d rather not’. A copy of the invitation text can be found in Appendix E. If a participant chooses to take part in the study, they will be asked to complete the online consent form. If they do not respond or say they would like to know more about the study first they will receive a telephone call from and interviewer to explain the study and invite them to take part.

If consent is received, text links to SIP e-surveys will be emailed and texted to participants. If e-surveys are not returned within 1 week, surveys will be posted to participants. Participants that have not returned surveys by 3 weeks will be phoned by interviewers to ask if they would still like to take part. Once SIP e-surveys have been received, interviewers will telephone participants to complete the SIP telesurvey.

A copy of SIP e-survey and SIP tele-survey script can be found in Appendix F. Copies of consent forms can be found in Appendix G.

Once a participant has completed both the SIP e-survey and the SIP tele-survey £10 remuneration will be sent by post.

RCT Data

Once a participant has consented to the study, their participant number will be used to locate their trial data. Trial data includes demographic, social and service use data. This data will then be merged with SIP survey data.

1.1.11 STUDY SIZE

The 'gettested' trial recruited a total of 2072 participants of which 95% 2012 were followed up. Of the 2012 that were followed up, 1409 (711 control group, 697 intervention group) indicated that they would be happy to take part in future research. We will invite the total population to take part in the survey. We conservatively estimate that 50% of the population will be consent to take part (n=705) Based on trial follow up, we predict that 95% of those who consent to take part will complete (n=670), of which roughly half (n=335) will be from the intervention arm and half from the control arm (n=335).

The primary outcome: to determine how demographic, social and psychological factors differ between online service and users of face-to-face services for STI testing at trial follow up require an exploratory analysis. Multivariable models will be built to explore the factors that predict the use online services for STI testing. These models require a minimum of 10 cases per item in the model. If 40% of participants in the intervention arm (n=134) used online services for STI testing this would allow up to 13 factors in the final model (Table 3).

Table 3- Maximum explanatory variables permitted for 335 participants for differing portions of services use

Proportion using online service	Number of explanatory variables in the final model
10%	3
20%	6
30%	10
40%	13
50%	16

1.1.12 STATISTICAL METHODS

Analysis will be carried out using STATA13. Missing data will be dealt with using multiple imputation. This method complete missing data by randomly selecting an individual with similar observed values and imputing the replacement value based on the selected individuals observed value for that variable [52]. Datasets will be merged and cleaned in STATA13 prior to analysis. Analysis will include between subject analysis and within subject analysis.

Between subject analysis

Bivariate analysis of associations between exposure variables and binary outcome variables will be carried out using chi square tests (categorical variables), t-tests or appropriate non-parametric tests (numerical variables). We will investigate for potential confounders by looking at relationships between exposure variables. Logistic regression will be performed to examine the strength of association between exposure variables with a p value of < 0.05 and the outcome variable.

In order to explore the factors associated with use of online STI testing we will use multivariable logistic regression. The multivariate models will examine the strength of association between exposure variables with a p value of <0.05 and the outcome variable. Multivariable models will be built using a hierarchical conceptual framework based on Anderson's model for the Individual Determinants of Medical Care Utilization in the United States with forwards stepwise regression [53]. To avoid an excess number of variables and unstable estimates in the subsequent model, only variables with a p-value of 0.10 will be kept in the subsequent model analysis [53].

We will look for evidence of effect modification and if present, stratified results will be presented separately. Within subject analysis (refer to Sutton et al)

To determine the extent to which service channel use for STI testing is influenced by perceived risk of infection and perceived type of infection we will carry out within subject analysis using random intercept logistic models. Using this type of model, we are able to control for non-independence (for example the fact that some individuals always have higher values than others) among the repeated observations for each individual.

Figure 5- analysos pf pitcp,es

Outcome	Unit of analysis	Description	Variable type	Descriptive statistics	Analytical statistics
Service use (trial)	Trial data by arm	Use of allocated service by trial arm	Binary	Bivariate analysis using chi square tests t-tests or appropriate non-parametric tests	Multivariate logistic regression
Online services use (any)	Cross sectional data (total population controlling for allocation in trial)	Any use of online services within study period compared with no use of online services within study period	Binary	Bivariate analysis using chi square tests t-tests or appropriate non-parametric tests	Multivariate logistic regression
Multiple service users	Cross sectional data (total population controlling for allocation in trial)	Two more uses of online service compared to two or more uses of face to face services	Binary	Bivariate analysis using chi square tests t-tests or appropriate non-parametric tests	Multivariate logistic regression
Intended type of services use	Cross sectional data (total population controlling for allocation in trial)	Those that intend to use online services compared to those that intend to use other types of service	Binary	Bivariate analysis using chi square tests t-tests or appropriate non-parametric tests	Multivariate logistic regression
Perceived risk	Within subject analysis	The effect of perceived risk on service channel use	Binary	Chi square tests	Random intercept logistic regression
Perceived infection	Within subject analysis	The effect of perceived infection on service channel use	Binary	Chi square tests	Random intercept logistic regression

1.1.13 RESULTS AND DISSEMINATION

The research findings will be shared with the SH:24 design team. Findings will also be shared publically through publication in order to inform future service design for STI self-sampling services.

1.1.14 STRENGTHS AND LIMITATIONS

This study is the first of its kind that explores demographic, social, individual and psychosocial factors that influence use of online services for STI self-sampling at home in London.

Limitations

The cross-sectional nature of the data limits the ability to make causal inferences. This study investigates the individual factors that influence service use with trial participants rather than ‘real users’ and trial participants may differ from ‘real users’ of the service and therefore the results of this survey may not be generalizable to ‘real users’ of the service. We will investigate these differences by comparing the demographics of trial users with data from real service use.

The amount of time between when a participant is recruited to the trial and when they receive the survey will be in excess of 12 months. This part of the study acts as both a strength and a limitation. Allowing more time to pass since a participant’s trial enrolment allows for the effect of the intervention to reduce, resulting in more of a homogenous population. It also allows for more data on service use to be collected. This time period is a limitation when asking about perceived risk and type of infection at time of testing as increased time is likely to result in recall biases. We will measure the time from trial recruitment to survey response and report any differences. Although the length of time between recruitment to the trial and the survey completion is not ideal, we feel this is a novel opportunity to survey those who were offered the service but chose not to use it as this.

The use of variables measured using Likert scales are subject to distortion from several causes

- Avoidance of using extreme response categories (central tendency bias)
- Agreeing with statements as presented (acquiescence bias).
- Respondents hope to portray themselves in a socially favourable way (social desirability bias) [59]

We will minimise these biases by using validated Likert scales where possible.

1.1.15 DATA MANAGEMENT

Paper survey forms will be stored securely in a lockable cabinet. Data will be entered and stored on a password protected computer. All electronic files will be stored securely on password protected computers at King’s College London and backed up on removable storage devices stored in a lockable cabinet. Only the study team will have access to the data.

Surveys will be identified using the same unique identifiers numbers used in the ‘gettested’ trial in order to link up data on outcomes. Participants will not be asked to provide any personally identifiable information on the survey form.

Electronic data files (trial data and SIP survey data) will be merged so that participants’ trial and survey data are found in one file.

Data will be stored for five years then destroyed.

1.1.16 ETHICS

Ethical approval

We have received R&D approval from Kings College Hospital NHS Foundation Trust (lead site) and Guy's and St. Thomas' NHS Foundation Trust as an amendment to the 'gettested' trial ethics approval.

Informed consent

All participants recruited into the study will be provided with information about the study in an online version and given the opportunity to ask questions and clarify queries with the Study Coordinator by email or by phone.

Participants' rights

Participants will be able to contact the study co-ordinating centre at Kings College London by email or by phone with any queries or doubts for the duration of the study. No personally identifiable details will be collected with the survey data.

Remuneration

Participants will receive a total of £10 for taking part in the survey. This will be sent following completion of the survey.

Appendix Z: STROBE Checklist for Chapter 9

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Stated in methods, not in title.		
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Thesis background		
Objectives	3	State specific objectives, including any prespecified hypotheses
Tables 9.1 and 9.2		
Methods		
Study design	4	Present key elements of study design early in the paper
9.1.3 study design presented		
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Short description in chapter 9, longer description in Chapter 4		
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Figure 9.1 flow chart 9.2 study participants		
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
In text and in supp material		

	Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
	In text and in supp material		
	Bias	9	Describe any efforts to address potential sources of bias
	Confounding described and weighting		
	Study size	10	Explain how the study size was arrived at
	In text		
	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
	In text and supplementary material		
	Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
			(*b*) Describe any methods used to examine subgroups and interactions
			(*c*) Explain how missing data were addressed
			(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
			(*e*) Describe any sensitivity analyses
	9.1.6		
	Results		
Participants	13*		(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
			(b) Give reasons for non-participation at each stage
			(c) Consider use of a flow diagram done
Descriptive data	14*		(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders done
			(b) Indicate number of participants with missing data for each variable of interest reported in tables
			(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)

Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time done
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures done
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included done
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses done
Discussion		
Key results	18	Summarise key results with reference to study objectives done
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias done
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence done
Generalisability	21	Discuss the generalisability (external validity) of the study results done
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based wider PhD

Appendix AI: Theoretical Basis for Selecting A-Priori Confounders in The Analyses

Demographic variables

It was assumed that age, gender sexual orientation and ethnicity acted as confounders in the relationship between the exposure variables and the outcome of services use. Confounders are defined as variables that are associated with the exposure variable and the outcome variable and not on the causal pathway between the exposure and the outcome [47].

There is evidence drawn from both qualitative interviews and empirical studies that demographic factors such as age, gender, sexual orientation and ethnicity are closely related to the exposures of interest, psychological perceptions around STIs and STI testing [38, 48] The association between demographic variables and the outcome of online service use is demonstrated in the cross-sectional analysis of routinely collected data presented in chapter 3 [38]. Because the demographic factors age, gender, sexual orientation and ethnic group are attributes of the individual that are not caused by the exposure variables of interest, these meet the criteria to be considered as confounders in the statistical analysis. These variables were considered confounders aprori and included in all adjusted analyses.

Perceived risk of infection

Perceived risk of infection and perceived HIV infection were considered as confounders of the relationship between:

- Trust in face-to-face services
- Trust in online services
- Self-efficacy to self-sample
- Health confidence
- Professional support
- Specific items relating to convenience

The theoretical relationship of these variables was derived from qualitative interviews, where participants described how higher levels of perceived risk, or perceived risk of HIV influenced trust in services, self-efficacy, health confidence, professional support and items relating to convenience (chapter 6). Because participants also highlighted that perceived risk may have an independent association with service use, perceived risk of infection and perceived risk of HIV were statistically investigated as potential confounders for these factors. Perceived risk of infection and perceived risk of HIV infection were considered as possible confounders for each other as these are theoretically linked. Perceived risk of infection was not considered a confounder for subjective norms, or stigma, shame and judgement as it was not considered viable that perceived risk of infection to influence these factors.

Previous use of online services

Previous use of online services was derived from self-reported service use data within the databases. This variable measure realised use of services, which, according to Bandura's theory of mastery experiences is the first and foremost source of self-efficacy, health confidence and other factors influencing trust in a health service and subjective norms [49]. As previous service use precedes these factors it was considered as an ancestor of latent variables associated with trust, self-efficacy and health confidence. Data generated

within qualitative interviews also confirmed Bandura's theory within the context of access to online services for STI testing at home. In interviews, participants described how previous use of services would improve trust, self-efficacy the norms around testing online and reduce the need for a health care provider. Based on this, previous use of online services was theorised as an ancestor to these exposure factors.

However, because of the design of this study, factors associated with barriers to access were measured after participants had experienced using online services. This may have influenced their reporting of these factors. Because of the strong empirical evidence for the influence of previous use of services, and the retrospective design of the study, the role of previous use of online services has been considered an important factor relating to access to online services. This has been included as a confounder for barriers relating to trust in services, subjective norms, self-efficacy, health confidence, professional support single items relating to convenience, difficulty of access to face-to-face services and difficulty in receiving a package in the post.

Difficulty in receiving a package in the post and difficulty in attending a face-to-face service

Surveys measured the difficulty receiving a package in the post or difficulty attending a face-to-face service. These practical measures were included to account for differences in circumstances between testing events. Participants described the independent influence of these circumstantial factors on service use. Based on data from qualitative interviews, these practical measures were also associated with feelings about convenience, and measures associated with privacy (stigma, shame and judgement). These practical measures were closely related to feelings about convenience theoretically. Participants in qualitative interviews also described how feelings about stigma, shame and judgement would influence how easy or difficult they felt it was to attend a face-to-face service or receive a package at home. Therefore, difficulty in attending a face-to-face service and difficulty in receiving a package in the post were statistically tested as potential confounders for items relating to convenience, and the stigma, shame and judgement scales, as well as to each other.

Appendix BI: Statistical Relationships Between Co-Variates

Once the theoretical relationships between variables had been developed, parametric and non-parametric tests were carried out to examine whether a statistical relationship between these variables was present within the data. Table 1 describes the relationship between each co-variate and the outcome of online service use. Previous use of online services, difficulty attending a face-to-face service, difficulty receiving a package in the post and perceived risk of infection were associated with use of online services (p=<0.15). However, in this study, and contrary to previous findings in chapter 5, demographic variables for age, gender, sexual orientation and ethnic group were not statistically associated with use of online services. This may be due to the small sample size and the relatively homogenous sample that results from sampling from a trial population.

Table 2 describes the relationship between covariates and the exposure variables of interest. Only those co-variates that were theoretically associated with the exposure variables were tested for statistical significance. The factors statistically associated (p=<0.15) with both the exposure variable of interest and the outcome variable of service use are in bold, red text. Multivariate logistic regression models were built to include confounding factors.

Table 1:

Covariate	**Last use Of services**
Age group	0.608
Gender	0.655
Sexual Orientation	0.964
Ethnic group	0.701
Previous use of online services	**<0.001**
How difficult is it to attend a face-to-face service	**<0.001**
How difficult is it to receive a package at home	**<0.001**
Perceived risk of infection	**0.099**
Perceived HIV infection	0.454

Table 2:

	Age	Gender	Sexual orientation	Ethnic group	Previous use of online services	Difficulty in face-to-face attendance	Difficulty in receiving a package in the post	Perceived risk	Perceived risk of HIV
Trust in clinics	0.725	0.024	0.275	0.179	**0.007**	-	-	0.231	0.074
Trust in online	0.193	<0.001	0.189	0.261	**<0.001**	-	**-**	**0.084**	0.152
Subjective norms	0.298	0.311	0.090	0.002	**<0.001**	**-**	**-**	-	-
Self-efficacy to self-test	0.549	0.220	0.898	0.161	**<0.001**	-	**-**	**0.109**	0.842
Health confidence	0.743	0.036	0.048	0.913	**0.005**	-	**-**	**0.003**	0.923
Professional support	0.018	0.722	0.452	<0.001	**<0.001**	**-**	**-**	0.793	0.576
STI related stigma	<0.001	0.608	0.011	0.004	-	**0.072**	**0.024**	-	-
STI related shame	0.002	0.444	0.001	0.018	-	**0.088**	**0.049**	-	-
Judgement by an HCP	0.319	0.422	0.701	0.004	-	**0.109**	0.177	-	-
Convenience									
Quick result	0.322	0.322	0.580	0.097	**0.028**	0.172	0.365	**0.067**	0.307
Don't wait too long	0.600	0.039	0.599	0.021	0.355	0.334	0.172	0.303	0.686
Take the tests ASAP	0.325	0.222	0.994	0.204	**0.034**	0.957	0.708	0.473	0.055
Test at a time that suits me	<0.001	0.520	0.118	0.092	0.162	0.321	0.619	**0.002**	0.143
Don't have to wait for an appointment	0.698	0.987	0.213	0.018	0.819	**0.022**	0.444	0.790	0.563
Previous use of online services	0.304	0.009	0.961	<0.001	-	**0.002**	**<0.001**	-	-
Difficulty in face-to-face attendance	0.075	0.246	0.005	0.002	**0.002**	**-**	**0.007**	-	-
Difficulty in receiving a package in the post	0.024	<0.001	0.004	<0.001	**<0.001**	**0.007**	-	-	-
Perceived risk	0.754	0.388	0.830	0.265	-	**-**	-	-	<0.001
Perceived risk of HIV	0.023	<0.001	<0.001	0.060	-	**-**	-	**<0.001**	-

P values in red indicate a statistical association with both the outcome and the exposure. Empty cells indicate no theoretical confounding.

Appendix CI: Characteristics of participants that completed the telesurvey

Covariate	Total population N=431 (%)	Tested for an STI at least once following trial n (%)	Did not test n (%)	P-value for difference (tested online v tested face-to-face)
Age in years (mean SD)	25 (3.37)	24.99 (3.37)	25.16 (3.42)	0.361
Gender				
Female	277 (64.27)	162 (66.67)	115 (61.17)	0.197
Male	152 (35.27)	79 (32.51)	73 (38.83)	
Transgender	2 (0.46)	2 (0.82)	0	
Sexual Orientation				
Heterosexual	345 (80.05)	180 (74.07)	165 (87.77)	**0.003**
Homosexual	49 (11.37)	38 (15.64)	11 (5.85)	
Bisexual	31 (7.19)	22 (9.05)	9 (4.79)	
Prefer not to say	6 (1.39)	3 (1.23)	3 (1.60)	
Ethnic group				
White British	270 (62.65)	146 (60.08)	124 (65.96)	**0.016**
White other	60 (13.92)	30 (12.35)	30(15.96)	
Black African	17 (3.94)	13 (5.35)	4 (2.13)	
Black Caribbean	17 (3.94)	14 (5.76)	3 (1.60)	
Mixed white/black African or Caribbean	15 (3.48)	11 (4.53)	4 (2.13)	
Black other	3 (0.70)	3 (1.23)	0	
South Asian	11 (2.55)	3 (1.23)	8 (4.26)	
Any other group	38 (8.82)	23 (9.47)	15 (7.98)	
IMD Quintile				0.463
1 (most deprived)	142 (32.95)	84 (34.57)	58 (30.85)	
2	206 (47.08)	111 (45.68)	95 (50.53)	
3	72 (16.71)	44 (18.11)	28 (14.89)	
4	9 (2.09)	3 (1.23)	6 (3.19)	
5 (least deprived)	2 (0.46)	1 (0.41)	1 (0.53)	
Service use during trial				0.103
Did not test	110 (25.52)	58 (23.87)	52 (27.66)	
Tested Online	279 (64.73)	155 (63.79)	124 (65.96)	
Tested in a face-to-face service	42 (9.74)	30 (12.35)	12 (6.38)	
Reason for not testing				
Did not need to	-	-	164 (87.23)	
Did not have time to	-	-	18 (9.57)	
Did not want to	-	-	1 (0.53)	
Too embarrassed to	-	-	2 (1.06)	
Other	-	-	3 (1.60)	
Total	**431**	**243**	**188**	

Appendix DI: Description of co-variates

Variables	Variable type	Description	Dataset of origin
Socio-demographic variables			
Age	Numeric	Derived from DOB by patient at RCT baseline and date of telesurvey. Analysed in years.	RCT baseline
Gender	Categorical	Male/Female/ Transgender As reported by participant	RCT baseline
Sexual Orientation	Categorical	Heterosexual/ Homosexual/ Bi-sexual/ Prefer not to say As identified by participant	RCT baseline
Ethnic group	Categorical	Derived for parsimony from self-reported data in trial as per the classification used for the 2001 census.	RCT baseline
IMD quintile	Categorical	Quintiles of indices of multiple deprivation derived from postcode data using 2011	RCT baseline
Individual factors			
Trust in Face-to-face sexual health services	Summary score	4 item scale (5-point response) Lower scores indicate less trust, higher scores indicate more trust	e-survey
Trust in online sexual health service	Summary score	8 item scale (5-point response) Lower scores indicate less trust, higher scores indicate more trust	e-survey
Subjective norms for STI testing online	Summary score	3 item scale (5-point response) Lower scores indicate less normal, higher scores indicate more normal	e-survey
Self-efficacy to self-test	Summary score	4 item scale (5-point response) Lower scores indicate less self-efficacy, higher scores indicate more self-efficacy	e-survey
Health Confidence Score	Summary score	4 item scale (5-point response) Lower scores indicate less health confidence, higher scores indicate more health confidence	e-survey
Professional support	Summary score	5 item scale (5-point response) Lower scores indicate less preference for professional support, higher scores indicate more preference for professional support	e-survey
STI related stigma	Summary score	4 item scale (5-point response) Lower scores indicate less stigma, higher scores indicate more stigma	e-survey
STI related shame	Summary score	4 item scale (5-point response)	e-survey

		Lower scores indicate less shame, higher scores indicate more shame	
Judgement by an HCP	Summary score	4 item scale (5-point response) Lower scores indicate less perceived judgement, higher scores indicate more perceived judgement	e-survey
Inconvenience of testing in face-to-face	Individual item score 5-point response scale	5 single items relating to convenience 1= lower preference 5 = higher preference	e-survey
Factors that vary between testing episodes			
Previously tested online	Binary	Derived from self-report at baseline of trial, trial outcome data and self-report during tele-survey	RCT baseline/ follow up and telesurvey
How difficult is it to attend a face-to-face service	10-point response scale	Asked to recall at the time of STI test Rate how easy or difficult the following it was for you: to attend a sexual health face-to-face service within opening hours 1= not difficult 10= extremely difficult	tele-survey
How difficult is it to receive a package at home	10-point response scale	Asked to recall at the time of STI test Rate how easy or difficult the following was for you: To receive a postal package containing a STI testing kit discretely at home 1= not difficult 10= extremely difficult	tele-survey
Perceived risk of infection	10-point response scale	Asked to recall at the time of STI test At this time, can you rate how worried were you that you may have had an infection? 1 = not at all worried and 10 =extremely worried	telesurvey
Perceived HIV infection	Binary	Derived from the following question Asked to recall at the time of STI test Which STI did you think you were most at risk of having? (multiple answers may apply) Any response that included HIV coded as 1, responses that did not include HIV coded as 0,	telesurvey

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